IN THIS ISSUE—S. A. E. SUMMER MEETING FORECAST

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The AUTOMOBILE

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NEW YORK, JUNE 21, 1917

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"—Words cannot express our appreciation of the faithfulness shown by the *Van Sicklen Speedmeter* in guiding us over all highways, mountain passes filled with snow, desert trails and rain-swept country***"

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Very truly yours,

Captain ... United States Tour

"From hottest of Summer days to 30 degrees below zero*** Our mileage tallied in every instance with that recorded in our Blue Book."

Catalog of Van Sicklen Speedmeters mailed on request.

The Van Sicklen Company — Elgin Illinois *Factory — Elgin National Watch Co.*

The Automobile

Vol. XXXVI New York—Thursday, June 21, 1917—Chicago No. 25

Industry's $600,000,000 Job

Automobile Makers Must Prepare To Undertake Tremendous Task of Producing Airplanes in Quantities—100,000 Output Suggested To Destroy Germany's Air Power

Airplane Motor Manufacture Much More Difficult Than Automobile Engine Building

WASHINGTON, June 18—The contemplated appropriation of $600,000,000 for aviation to build various kinds of war planes, to train aviators and mechanics, and to perform everything else in connection with the work is a staggering problem that confronts the automobile industry. We mention it as confronting the automobile industry because the great bulk of this work will have to be cared for by the industry. The aviation industry can care for only a small part of it and the automobile industry is the only other one qualified to handle this work. This huge total thrust upon an industry in its swaddling garments is scarcely comprehensible. To gain a conception of its meaning we might think of a similar appropriation having been made for the manufacture of automobiles 15 years ago. It is impossible to comprehend just what this means to the aviation industry in America, and as there is scarcely an aviation industry to care for it the conception of what it means to the automobile industry is equally great.

To Control the Air

The appropriation of $600,000,000 for aviation means that the Allies are going to make a strong bid to win the war by control of the air, to send enough airplanes, aviators, mechanics and other necessities to France to literally drive the Germans out of the sky on the Western front. Driving them out of the air would be a wonderful accomplishment. It would be equivalent to putting out the eyes of the German army. Without their airplanes the Germans could not direct their artillery fire, which would be very much reduced in effectiveness. Without the airplanes the Germans could not detect the massing of Ally forces for attacks. With the Germans out of the air the Allies could maneuver their forces for line-turning and other maneuvers which are now rendered impossible by the German airplanes. Once the Germans are driven out of the air it will be possible with a great number of Allied planes to make bombing attacks on German quarters and concentration points and factories a hundred or more miles back of the lines. It is because of these many possibilities that apparently the War Department at Washington, directed by the Advisory Commission of the Council of National Defense, has drafted such a bold aerial program. Howard E. Coffin and E. A. Deeds, of the Aircraft Production Board, are naturally the leaders in the Council of National Defense in this movement.

Variety of Planes Needed

The possibilities of aerial work are shown by the great variety of airplanes necessary in the work. At present the Allies have a tremendous number of airplanes performing eight or ten different kinds of work over the Western front every day. These planes in their different organizations carry on their work for perhaps 15 to 18 hr. each day, irrespective of weather or other conditions. Their organization is as complete as that of an army of infantry, a squadron of cavalry, or a corps of artillery. No longer is there any question of airplane work. The airplane is working as hard in the storm as in the sunshine. It is no longer a fine-weather weapon.

The airplane service is divided into a few divisions

as follows: There are planes that go in bombing squadrons, namely, to drop bombs on headquarters back of the lines. Such planes have to fly relatively low and are not of the speediest type. Other planes are used entirely by photographers who fly relatively low and are working many hours a day. There are others who do nothing but co-operate with the heavy artillery, signaling to them if their fire is accurate and correcting ranges, etc.

Practically all of these three types of planes for bombing, photographing and directing artillery fire are incapable of defending themselves from hostile attack, and there are two other types of planes whose sole duty is to fight. They are fighting machines. One type is known as the heavy fighting craft which sails at several thousand feet above the planes it is protecting, and the other craft is the high-speed, light fighters that might be described as scout machines. These have remarkable speed, running as high, it is said, as 120 m.p.h., which is faster than the heavy fighters and much faster than the artillery machines.

In addition there are other duties for airplanes: Some are used for long-distance reconnaissance work and fly 20 or 30 miles over the line. There are other machines which do reconnaissance work over the lines only, noting any changes made from day to day.

There are still other machines which accompany the infantry when making attacks and are able to serve as connecting links between the attacking infantry and the headquarters staff directing the attack.

With these representing a few of the many possible activities for airplanes at the front, it is possible to see how $600,000,000 will be required for a great program such as planned. To take care of such a program and to build such a variety of machines will be no light tax on the automobile industry. The manufacture of motors alone is a big problem to undertake. The manufacture of the planes is also great.

Engine-Building Is Difficult

It must be remembered in training aviators there is great destruction. Reports have reached this side that over thirty aviators-in-training are killed per day in England. Should this be the case it means a heavy destruction of machines in this work alone. It has been suggested that America should plan to build 100,000 airplanes. What this means is difficult to grasp. The manufacture of an airplane engine is an immeasurably harder task than manufacturing an automobile engine; in fact, in these days the manufacture of the automobile engine looks like mere play as compared witth manufacturing engines for motor trucks, farm tractors and airplanes. The airplane engine might be described as a 100 per cent engine. From the instant it leaves the ground until it returns it is wide open, working at its maximum power.

The farm tractor engine has been described as a 90 per cent engine because it is under load the majority of its time. The motor truck engine might be spoken of as a 40 per cent one, and the automobile engine as a 15 per cent power plant, in that it is rarely if ever working at full power, such as the airplane engine is.

Because of this greater load on the airplane engine, its manufacture is much more difficult. One engineer has stated that building 100,000 airplane engines would be much more than building 1,500,000 automobile engines. We cannot vouch for these or any similar figures, but the problem of building airplane engines is much greater than that of building automobile engines.

Already active steps are being taken to meet the higher requirements of making airplane engines. Over 100 mechanics have been sent to the airplane factories of Europe to familiarize themselves with the greater care of manufacture. Howard Marmon is at present heading an organization to study the problem in Europe. Other steps are being taken and the industry is setting out in a business way to absorb this new art.

The life of an airplane engine in service on the front is variously stated to approximate 50 hr., perhaps 100. After that period of service the engine is removed from the plane, taken apart and rebuilt as necessary. It is reported that in normal service on the West front an airplane motor is given approximately 2 hr. service each day. One aviator may have five different planes, all of which he may use on the same day. For each aviator there are approximately five mechanics who keep the different engines and planes in commission. It is very rarely that a plane returns to the ground without having some parts of its wings damaged by shell or other fire.

The short life of an airplane engine as compared with a motor truck engine or a farm tractor engine makes this aviation business immeasurably greater than at first appreciated.

Build Training Planes First

For the present, unquestionably, the United States will aim at building only machines used for training aviators and not those engaged in actual fighting at the front. If America can build all of the training planes necessary for the training schools of France and England, as well as America, it will leave the French and English airplane factories free to devote all their energies to manufacturing engines and planes for battle use. As time passes America will work into the manufacture of engines and planes for battle work.

The plans are at present to have 3000 or 4000 planes built in America by the coming spring. It may be possible to greatly increase this number, but the production of airplane engines and planes must not be thought of in the same way as automobile production has in the last 2 years. It is expected that America may eventually furnish 30,000 or 40,000 planes for the war zones. Some enthusiasts hope that 100,000 planes may be furnished, but they have no conception of what furnishing this number means, when the status of airplane engineering in America is duly considered.

It would seem a wise decision on the part of the war department to plan such tremendous aviation activity. First, the great value of airplanes on the Western front would warrant this; second, the shipping facilities of to-day make such a program highly desirable. It has been suggested that one aviator at the present time is as valuable as 1000 men on the Western front. This is a relative statement and not to be applied under every circumstance of attack or drive. With our shipping facilities greatly reduced by submarine attacks, it is good business to ship airplane engines and the knock-down planes, together with aviators, as compared with requiring a great amount of shipping space for infantry, cavalry, etc. To make a real dent on the Western front with infantry would require great numbers, whereas a few thousand airplanes would be a very considerable addition to the air squadrons at present in use.

150,000 Mechanics Needed

The $600,000,000 appropriation for aviation means many other things to the automobile industry. If we eventually furnish 30,000 air planes to Europe this will require 150,000 mechanics. We cannot spare these

from the factories, but they must come from the repair shops and the garages throughout the country. This number, if required at once, would mean approximately five from each garage in the country. Such a draft at one time would entirely destroy the automobile and truck maintenance of the country. Fortunately these will be taken in small drafts and at different times so that repair shops and garages will be better prepared to meet the situation.

Commercial Use in Future

It is interesting to speculate on the future of aviation when the war is ended. The tens of thousands of planes then in use will not be laid aside; they will not be confined solely to militaristic pursuits; they will be brought into commercial fields. Nobody can foresee what the exact possibilities of the airplane and commerce will be, but it will be an unquestionably potent factor. Already mail routes by airplane are being discussed. It is possible that express passenger lines will be established. There are limitless possibilities. The airplane is now as stable as an automobile, in fact, at high speeds it is considered much safer. The days of unstable aviation are past. The airplane has been pushed ahead 10 or 20 years in almost as many months. It is a new factor in world transportation.

Lelands To Leave Cadillac

To Make War Airplanes for U. S. Government—R. H. Collins General Manager

DETROIT, June 18—Henry M. Leland, president and founder of the Cadillac Motor Car Co., and his son W. C. Leland, vice-president and general manager of the company, have resigned. Both father and son will end their duties with the Cadillac company July 31, the end of the fiscal year, and will begin the manufacture of war airplanes for the United States government on a large scale.

R. H. Collins, formerly sales manager of the Buick Motor Car Co., Flint, Mich., and for the past year acting as assistant to W. C. Durant, president of the General Motors Corp., has been appointed general manager of the Cadillac Motor Car Co. Mr. Collins also will become president of the company.

Lelands' Plans Definite

Mr. Leland is not yet ready to state where his new factory will be located, although he and his son have carefully mapped out the plan of procedure. They expect to manufacture on a huge scale. Early in the war Mr. Leland visited England to study aviation needs and conferred with Lord Montague, Lord Sydingham, Sir Albert Stanley, and others. He has recently been in constant conference with members of the Council of National Defense. Referring to airplane conditions he states that at the present time there is not an airplane made in America that is fit to fly over Germany during the war and that most of the machines that have been made were manufactured by enthusiasts for experimental purposes. He said he "is going to help the United States put a fleet of aircraft in the air that will be built along scientific lines and will be safe to use over the hostile army." It is believed that the new factory will be located in or near Detroit. Mr. Leland and his son will retain their financial interests in the Cadillac Co.

Henry M. Leland founded the manufacturing concern of Leland & Faulconer in 1890. In 1902 he established the Cadillac Automobile Co., which became the Cadillac Motor Car Co. in 1904. He built the first one-cylinder car as well as the first eight-cylinder car in America and twice won the Dewar prize for automobile standardization. He was elected president of the Society of Automobile Engineers in 1913 and has for years been regarded as one of the biggest men in the industry.

—

Aircraft Board Will Call Upon Many Industries

WASHINGTON, June 20—The Aircraft Production Board will utilize manufacturing equipment in many different industries in building the great number of aircraft for which plans are now being made and existing aircraft factories will be enlarged and concentrated upon some one of the types of machines needed by the war and navy departments.

This plan, it is stated, has been used to some extent by both England and France. It also is stated:

"The American automobile industry is the most highly organized and the most extensive of its kind in the world, and the same system of standardized parts and quantity production of machines which has enabled the United States to have three and a half millions of automobiles on the road where all the other nations together have less than a million will be turned to the making of aircraft."

That motor building plants, sewing machine and typewriter plants and woodworking and other institutions also will be called upon to do their part in the building of aircraft, is probable.

—

Industrial Engineers Work with U. S.

CHICAGO, June 20—The Council of National Defense has directed the Society of Industrial Engineers, organized here May 26, to gather complete data on equipment of all plants that can aid in manufacture of airplanes or parts of aircraft. The order came at the close of the National Conference of Industrial Preparedness held under the auspices of the Western Efficiency Society, which closed Monday. The society also will list all industrial engineers whose knowledge and training may be of service in war. The following officers were elected: Chairman Board of Directors, Charles Buxton Going, New York; Treasurer, S. T. A. Liftis, Chicago; Assistant Treasurer and Secretary, G. C. Dent, Chicago: Mr. Going will have headquarters in Washington.

Curtiss Plant for Toledo

Willys To Become President — Large Factory Will Be Near Overland Property

TOLEDO, June 19—John N. Willys will become the new president of the Curtiss Aeroplane Co. and Toledo will soon have within its boundaries a large plant, close to the Willys-Overland Co. factory, for making all Curtiss engines. The present Curtiss plant at Hammondsport, N. Y., is inadequate to meet present demands.

British experts have visited Toledo and looked over the Overland factory, which they claim is the best fitted plant in the world for making airplane engines. Mr. Willys in a statement says, "The Willys-Overland Co. has been preparing for the manufacture of airplane engines for nearly a year. It has had two engineers who just recently returned in England studying the English method of manufacture, so we are familiar with the latest English and French practice in building engines. We have a surplus quantity of machinery necessary for engine manufacture, so we are in good shape to take care of governmental requirements in connection with the Curtiss company. There is no question about the necessity of the airplane in war, and it is generally conceded by British officers, with whom I have talked, that airplanes will be in general use after the war because of the large number of aviators trained for fighting."

—

New Chalmers Body Design

DETROIT, June 20—A new Chalmers body has been fitted to the present chassis and is called the Six Duplex. It is a four-passenger design and has speed lines. The body is a four-door type with slanting windshield, raked steering column, leather Scotch plated upholstery and Pantasote top and side curtains. This car sells for $1,475, f.o.b. Detroit.

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428 Reservations for S. A. E. Dinner

NEW YORK, June 19—To date 428 reservations have been made for the S. A. E. dinner to be held at the New Willard Hotel in Washington, June 26.

Aircraft Makers To Standardize

Technical Staffs of Companies to Co-operate with S. A. E.—Supplies for 2500 Airplanes

NEW YORK, June 16—The Aircraft Manufacturers Assn. decided to undertake the work of establishing its own standards for the aircraft industry in co-operation with the Society of Automotive Engineers at a meeting held here this week. The entire technical staffs of the manufacturers in the association have been placed at the disposal of the standardization committee and the S. A. E. will be invited to have representation on the committee, which will proceed with its work at once.

Material Plentiful

The materials committee reported that supplies on hand at the factories are sufficient to produce 2500 airplanes immediately, these comprising 4,000,000 ft. of air-dried spruce and 3000 yd. of Irish linen for wing and fuselage covering. The committee also reported that the efforts of the association have overcome difficulties hitherto experienced in the transportation of materials and the delivery of finished products from the allied trades. The association has established an industrial directory covering the fields supplying raw materials and finished products to the aircraft industry.

Advanced ideas in aeronautics and several safety devices are under consideration by the patents committee, which will select those best suited to immediate requirements and place them under development.

A letter was received by the advisory committee from Howard E. Coffin, chairman of the Aircraft Production Board, stating that there is no intention to concentrate the aircraft industry in Detroit, and urging the closest possible relations between the Board and Aircraft Manufacturers Assn. The advisory committee has been in consultation with authorities at Washington, and the members have made frank statements of their ability to produce airplanes in quantity. The manufacturers are only awaiting the action of the Government in ordering some of the 3500 airplanes it is planned to build before next spring to go ahead on quantity production.

Five Types of Machines

The aircraft industry can produce with its present equipment based on peace time operation five types of machines. While the manufacturers prefer to make their own types of machines in the greatest possible quantities and at the same time to carry along the development of the training type plane based on those in use by the Allies in Europe, they expressed their willingness to set aside for the present their equipment suitable for regular production and concentrate on the training machines which are needed immediately and then to follow later with their own types if desired.

The Society of British Aircraft Constructors is desirous of working in close co-operation with the Aircraft Manufacturers Assn. as set forth in the communication read at the meeting. The British society is composed of practically every British constructor of aircraft or aviation engines, and by affiliation with the American association renders available first-hand information based on actual observation developed from experience in the field and viewed from a manufacturer's standpoint. Although the aircraft industry in England was far inferior to the present state of the industry in America at the beginning of the war, the output of finished planes is now about 800 a week. The manufacturers engaged in this work have a capitalization of $375,000,000. The industry in America has a capitalization of about $20,000,000, and based on a peace time equipment can turn out in 3 months one-fifth as many planes as England with her experience of 3 years under war time conditions.

The publicity committee is active in correcting all erroneous impressions published regarding the manufacture of aircraft.

The Hall-Scott company was elected a manufacturing member of the association, with H. T. Whitaker as representative.

10,000 Employees

One feature brought out very clearly at the meeting is that the aircraft industry in this country has passed beyond the experimental stage, and is on the threshold of a great development.

Benjamin L. Williams, secretary of the association, says that the aircraft industry is in a position to meet the most liberal developments that can occur, as the factories are equipped and tooled up and their working forces comprise 10,000 men capable of turning out in quantity at least five different types of airplanes and seaplanes. Many factories are working on the relatively small orders so far placed by the Government and are only awaiting further orders to expand their facilities.

The following members attended the meeting: Inglis M. Uppercu, Aeromarine Plane & Motor Corp.; Frank H. Russell, Burgess company; J. T. Tarbox, Curtiss Aeroplane & Motor Corp.; Albert H. Flint, L-W-F Engineering Co.; H. B. Mingle, Standard Aero Corp.; Benjamin S. Foss, Sturtevant Aeroplane Co. and S. F. Sturtevant Co.; F. L. Morse, Thomas-Morse Aircraft Co., and Benjamin L. Williams, secretary Aircraft Manufacturers Assn.

—

Commerce Has Government Contract

DETROIT, June 18—The Commerce Motor Car Co. has received a contract from the Government to supply the Post Office Department with ¾-ton trucks for the coming year.

$600,000,000 for Aircraft

Administration to Back Bill —Not To Interfere With Other Work

WASHINGTON, June 18—Secretary of War Baker, on behalf of the administration, in an official statement declares that he will back the $600,000,000 appropriation for aircraft to the limit. This means the prompt passage of an appropriation measure carrying this sum, and also, incidentally, that the automobile factories of the country will soon be taxed to their utmost capacity in taking over aircraft production.

Secretary Baker in his statement said:

"The War Department is behind the aircraft plans with every ounce of energy and enthusiasm at its command. The aircraft program seems by all means the most effective way in which to exert America's force immediately in telling fashion.

"We can train thousands of aviators and build thousands of machines without interfering in the slightest with the plans for building up our armies and for supplying the Allies with food and munitions. To train and equip our armies and send them abroad will take time, however, and in the meanwhile we can be devoting to this most important service vast quantities of productive machinery and skilled labor which otherwise could not be contributing to the nation's cause in full proportion to its capacity."

—

Liberty Bond Sales to Employees in Industry Heavy

NEW YORK, June 18—The automobile and accessory industry last week kept up its good work in regard to the sale of Liberty Bonds. The employees played an important part in the sale of the bonds in the factories. The Hayes Mfg. Co., which purchased $89,250 worth of bonds, reported an average of $100 for every employee in the plant. Over 3500 out of 4800 employees of the White Motor Co., Cleveland, have subscribed an aggregate of $200,000 to the Liberty Loan. The company itself has subscribed $500,000 to the loan.

Within 2 days after the United States Tire Co. offered Liberty Bonds to the employees of its Hartford and Detroit factories $192,000 was subscribed. The Simms Magneto Co. has subscribed for $39,400 worth of bonds. The employees have subscribed for nearly $16,000 worth.

The Taylor-Wharton Iron & Steel Co., High Bridge, N. J., and its subsidiaries have arranged a plan for their employees to buy the bonds in installments at the rate of $5 per month for every $50 bond taken. Those working on day wage pay may take them at the rate of $1 per week for each $50 bond. Every subscriber will be protected in case of death.

Reo Wins in Valve Patent Suit

Barber Patent Not Infringed —$1,500,000 Involved— First Suit Lost

LANSING, MICH., June 18—The Reo Motor Car Co. was completely exonerated by a patent decision handed down by Judge Hazel of New York June 13 in the case of William Barber vs. the Reo Motor Car Co. This was the case in which the patentee sought to recover $1,500,000 for alleged infringement of his patent. In the preliminary trial, the Reo Motor Car Co. was given an adverse decision due largely to the fact that the company was certain that there was no similarity between the Barber patent and the Reo mechanism and failed to treat the matter seriously.

When the New York case finally came to trial, Reo introduced additional evidence with the result as above indicated —a decision to the effect that the Reo valve mechanism does not, either in design or in application, infringe the Barber patent.

—

Lapier Tractor-Truck Out

LAPIER, MICH., June 18—The Lapier Tractor-Truck Co. has placed on the market a tractor-truck, in two models, with Waukesha four-cylinder 3½ by 5¼ engine selling for $1,900 and $2,000.

The 2- to 3-ton type is furnished as a complete tractor with a cab and trailer without the body for $1,900 and the 3½- to 5-ton model which includes the complete tractor with the cab and trailer without the body is $2,000.

The tractor-truck engine has a separate head, three-point suspension, cylinders block cast, three main bearings, and built in governor. Lubrication is pump and splash type. Cooling is provided by a centrifugal pump, radiator and fan. Clutch is multiple disk, dry plate. A unit-power plant transmission with selective sliding and three speeds forward and one reverse is provided. The propeller shaft is the two universal joint type. Torbensen internal gear rear axle is used. The weight is carried on an I-beam dead axle. Roller bearings are used throughout, and all gears and bearings are fully inclosed and run in oil. The front axle is I-beam, drop-forged. Contracting service brakes and expanding emergency brakes operate on the rear wheels. Fixed spark and high-tension magneto ignition are features. Wheels are of wood, 34 by 4 front, 34 by 5-6 rear, with solid tires. Left hand side steering is provided. The frame is of 5-in. channel steel and the weight is 3000 lb., wheelbase 90 in.

—

New Jordan Sport Roadster

CLEVELAND, June 18—The Jordan Motor Car Co. has brought out a new model styled the Sixty Sport roadster. It is finished in three colors, a Mercedes red, a Liberty blue and a Briarcliff green. The new model is 200 lb. lighter than the previous model and is equipped with special vanadium steel springs. The rear springs are 59 in. long.

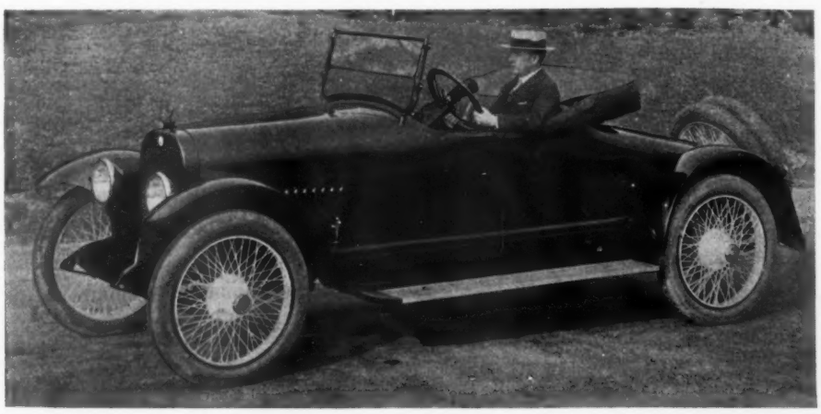
It is geared 4 1-12 to 1. The steering pillar is adjustable by ½-in. at the bracket, giving a range of 1 in. at the seat. The seat cushion is 10 in. thick and 21 in. deep and rests directly on the floor. The full width of the seat measures 44 in.

The rear deck covers a storage space 45 by 41 in., while the deck cover locks at both corners and is equipped with rubber bumpers and holder to sustain its position when raised.

—

Pennsylvania Employees Help Red Cross

JEANNETTE, PA., June 18—Employees of the Pennsylvania Rubber Co. have voted to abandon their annual picnic. This has been done so that the expense of the picnic might be saved and turned over to the Red Cross. Following this action of the employees, the Pennsylvania Rubber Co. sent its check for $1,200 to the Jeannette Red Cross Unit. The Pennsylvania company has recently issued to its employees life insurance policies, upon which it is paying a premium. To employees who have been with the company 1 year, policies for $300 are given; 2 years or over, $500; for each full year over 2 years, an increase of $100 annually until the maximum of $1,000 is reached.



Jordan four-passenger sport roadster. Price, $1,950 with wire wheels; $1,850 with wood wheels

Wall Is in Charge of Army Tanks

Commissioned a Major—Will Supervise Designing and Production of Armored Cars

INDIANAPOLIS, June 17—William Guy Wall, vice-president and chief engineer of the National Motor Car & Vehicle Corp., has been selected by the War Department to assume charge of designing and production of armored cars and tanks for the army. Following a trip to Washington last week, he accepted the offer of the Government and was at once commissioned a major by Secretary of War Baker.

Mr. Wall has had military training. He is a graduate of the Virginia Military Institute and served as an officer in a volunteer company he raised for the Spanish-American war. He has several mechanical successes to his credit. He designed and built the first American-made six-cylinder car, and was one of the first to sense the value and utility of the twelve-cylinder engine. He has been vice-president of the National company for 15 years. Major Wall will have his headquarters in Washington.

—

30 Trucks for Each Cantonment

WASHINGTON, June 19—The Quartermaster's Department is now engaged in furnishing trucks to Col. I. W. Littell, in charge of the construction of cantonments, for the use of contractors engaged in building these cantonments, and a total of thirty trucks for each of the sixteen cantonments will be provided.

The department will furnish whatever trucks the work calls for, these to be indicated by Col. Littell.

Drivers and mechanics to handle these trucks will be provided by the Quartermaster's Department. Major Charles B. Drake, of the purchasing department of the quartermaster's corps, says that compulsory orders to truck makers to furnish these trucks have not been issued and are not contemplated. He said the department does not anticipate any trouble in getting the necessary trucks promptly.

—

Army Inspects Tonford

DETROIT, June 18—Captain Renwick, U. S. A., who is now somewhere in the East following an inspection of automobile and parts plants in the Middle West, is in favor of the use of Tonford truck units combined with the Ford power plant for use in connection with a flying regiment. The regiment would combine armored cars and a motorcycle detachment. Captain Renwick stated that he proposed the use of 100 Tonfords with trailers as the principal mechanical component of the regiment, and estimated that each Tonford with trailer would carry thirty-two soldiers. The Detroit Truck Co., which manufactures the Tonford unit, will have a sample army truck completed shortly.

Munger Wins Rim Decision

Perlman Rim Corp. Suffers Another Blow—Munger Awarded Royalty

NEW YORK, June 20—The Perlman Rim Corporation has again been hard hit, this time by a decision in favor of Louis de F. Munger, who sued the corporation for infringement of the Munger rim patent No. 638,588, of Dec. 5, 1899. This decision in favor of Mr. Munger parallels in importance to the rim industry the result in the suit of Perlman against the Firestone company recently dismissed on motion of counsel for Perlman.

The Perlman corporation will appeal the suit, which concerned only back royalties. The validity of the Perlman patent is not affected by the decision.

In the suit of Munger vs. Perlman, Judge Manton has decided that "a decree will be granted in favor of the plaintiff and against the defendant, directing the defendant to account before a master, and the plaintiff may recover a reasonable royalty upon the patent in suit under the rule established in Dowagiac Mfg. Co. vs. Union Plow Co."

Munger's Contentions Sustained

Judge Manton's opinion sustains the contentions of Munger's counsel at every point. He says: "From the specifications * * * the claim need not be restricted to the specific embodiment and can be interpreted to cover what the plaintiff claims for it under the doctrine of equivalents."

The decision also goes on to say, "The patent need not be restricted to the precise relation of the wedge elements shown in the drawing, but is to be interpreted so as to include within its scope the obvious equivalent and arrangement of wedge surfaces in defendant's wheel, the structure of which so far as it comes within the scope of the invention and suit performs its function in practically the same way as the patented structure.

"The plaintiff rests his case upon the proposition that his claim must be so interpreted as to cover within a reasonable range of equivalents that which was new in the art with him, namely, the utilization of the wedge as a means for securing a tire-carrying rim upon a wheel in such a manner that the rim, under tension, produced by the wedge action, hugs the felly tightly when in use and can be removed readily by freeing the wedge surfaces.

"I am satisfied from the proofs that the plaintiff has shown, by the credible testimony, that in the practical operation of the wheels and rims made under the patent there was no such sticking of the rim on the wheel as to prevent its removal with the ordinary tools carried on the road, and that such a degree of utility exists which justifies sustaining the patent against the claim made by the defendant of inoperativeness and that, therefore, the patent has commercial utility."

The Perlman interests claimed that the Munger patent is invalid, particularly in view of a car wheel patent which the court says did not have rim removal in the sense of the Munger patent, and furnishes no warrant for the conclusion urged by the defendant's counsel.

On the question of the long delay in bringing the suit, Judge Manton finds that the long lapse of time is accounted for by the financial inability of Munger and his predecessors in interests to bear the expense of a patent litigation, and was sufficient to excuse the delay.

As to the notice of patent, the court finds that the marking of the patent on the wheels, manufactured commercially, was sufficient notice within the meaning of the statutes.

Damages Recoverable

It is understood that damages, estimated on a basis of reasonable royalty, as stated by Judge Manton, may be recoverable against such other makers for a period of about 5½ years preceding the expiration of Munger's patent on Dec. 5, 1916.

Claim No. 4, on which Mr. Munger sued, is as follows:

"In combination with a tapered felly, a tire, an annular rigid base to which said tire is secured, said base having a tapered under surface and fitted on said felly substantially as described."

Features of Patent

In the view of Judge Manton, Munger's patent and the Perlman rim alike use a wedge for securing a tire carrying rim under tension on an automobile wheel so that the rim shall hug the wheel tightly and be held firmly in position while at the same time it can be detached readily by freeing the wedge surface. The felly is tapered at one edge having a wedge flange held the equivalent of a wedge surface formed on the felly itself. The rim is an annular ridgid base and is adapted and intended in use to have the tire secured to it with a degree of permanence sufficient to resist effectually the accidental displacement of the tire. The rim has a tapered under surface slightly rounded, but possessing the function of a wedge surface co-operating with the wedge flange of the felly, whereby the rim is forced outwardly and put under tension as it is pressed on by the operation of the bolts and nuts.

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Fiat Radiator Suit Dismissed

NEW YORK, June 20—Judge Hand has dismissed the suit of the Fiat company against the A. Elliott Ranney Co. and the Daniels Motor Car Co., with costs, for lack of invention in its design patent. Fiat claimed infringement of its design patent No. 48,219, covering a radiator and hood design, issued Nov. 30, 1915, to Carlo Cavalli, Turin, Italy, who assigned it to the Fiat concern.

"War Spirit" Is New Fuel

English Gasoline Interests Pool Supply — Sold in Khaki-Colored Tins

LONDON, ENG., May 30—Instead of several brands of gasoline being sold throughout England, the government has decided that only one brand is to be marketed, and it will be labeled "war spirit." Heretofore some of the different brands of gasoline have been Pratt spirit (American), Shell spirit (Borneo) and various other brands. The new war spirit represents the supply of fuel which has been pooled by the different gasoline concerns for distribution. Instead of gasoline being sold in green or red cans as formerly, it is to be marketed in khaki-colored tins.

Renting Cars Prohibited

The use of automobiles throughout the British Isles is gradually being restricted. One of the latest restrictions is a prohibition on renting or hiring of automobiles. Since the start of the war a big business has been done in hiring; many private owners who have found it necessary to lay up their vehicles have hired cars from garages for trips through the country. Now no cars can be hired except under a special license which is only issued to a certain class of people whose work comes under specified headings. The police have organized themselves and made many arrests for violations of this rule. At times as many as six barriers of this police nature are encountered in 100 miles. The private motorist is not complaining loudly over these restrictions, as he knows they are not imposed until absolutely necessary. The police treat all cases with the utmost consideration and courtesy, which helps the situation very much.

Farmers Will Buy

The tractor advocation has accomplished an amazing result, one which seemed impossible 6 months ago. England is going to plow three times as much land as ever before and it is expected that when farmers are once started on this increased farming schedule they will not drop back to their old-time pace. As only a comparatively small percentage of farmers in England are automobile owners it is expected that this intensified farming will result in a greatly increased automobile market with agricultural classes. Unquestionably automobiles will sell to the farmers in greater quantities than ever before.

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Packard Sweepstakes Winners on Sail

DETROIT, June 18—More than 600 representatives of the Packard Motor Car Co., with their families, left Detroit today on board the steamer Noronic for a 3-day cruise. The Noronic will carry the dealers and their wives through sev-

eral of the Great Lakes and return here Thursday morning. These dealers were the winners of the Lincoln Highway Sales Sweepstakes conducted by the Packard company. Final conclusions of the sweepstakes will be announced on the cruise and the winners will be awarded hand-carved hall clocks.

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Springfield Type Detroit Electric

DETROIT, June 20—A new Detroit electric is being produced by the Anderson Electric Co. at $1,975, f.o.b. Detroit. It has a Springfield type body and side steering, although wheel steering is furnished for $30 extra. The body is finished in cobalt blue, with optional color wheels, Goodrich-Silvertown cord tires, 33 by 4 and 33 by 4½. A forty-two cell, thirteen-plate Detroit battery gives a maximum speed of 25 m.p.h. and a mileage of 65 to 100, depending on road conditions.

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87 Bid on Army Trucks

WASHINGTON, June 20—Eighty-seven manufacturers are represented by bids for the first 35,000 army motor trucks requested by the War Department. That makers are ready to contract for many times the Government's present requirements, is shown by the bids, three companies — Pierce-Arrow, Hurlburt and Nash—each offering to build the whole 35,000. Three concerns offered to build trucks at cost plus 10 per cent, and two manufacturers offered to produce ten trucks a day for an indefinite period. Some manufacturers are ready to deliver at once and others set varying delivery dates, ranging to 6 months in the future. The matter of quick delivery is expected to carry considerable weight in placing contracts.

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WASHINGTON, June 20—The Quartermaster Corps has decided that, to facilitate production of trucks, the department will insist only that manufacturers in filling orders from now on go as far as they can without causing delay in standardization or making uniform one or more of the parts of an engine.

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Ford Rushes Ambulance Order

DETROIT, June 19—The contract for 2400 ambulances for the United States war department involving $1,500,000 and which was reported last week in THE AUTOMOBILE is being rushed to completion by the Ford Motor Co. The order announced by Frank L. Klingensmith, vice-president of the company, is the first one given to Detroit makers.

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Fisher Body Earns $9.50 a Share

DETROIT, June 21—The Fisher Body Corp. and subsidiary company report net earnings of $2,876,407 for 8 1/3 months, after deducting all expenses, etc., interest on floating debt, $96,619; leaving net income $2,779,887, equal to $9.50 a share on the common stock. Net income is equivalent to over eight times the preferred dividend for the period on the $5,000,000 outstanding 7 per cent cumulative preferred stock.

Army Truck Details Interchange

S. A. E. Divisions Discover Possibilities of Unification of Parts Design

WASHINGTON, June 18—A number of meetings held here last week showed that the possibilities of getting interchangeable details in military Class A and B trucks were encouraging. Representatives of different parts makers conferred with the S. A. E. divisions and compared drawings of such matters as spring table positions and dimensions on stock axles, standard cooling fan, fan belt and mounting, bearing layout for transmissions, etc. The meetings were attended by the War Department representatives, and Capt. Britton is now examining the various recommendations with a view to obtaining the best possible co-ordination between the parts which the makers are able to supply from stock.

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May Reorganize Emerson Company

NEW YORK, June 19—Five stockholders in the Emerson Motors Co. have constituted themselves a committee of reorganization and have sent a notice to stockholders. This notice states that the committee is investigating the affairs of the company with a view of recommending action for the conservation of assets.

The committee states that the company is turning out cars regularly, but not in large numbers, and that the business should be conserved. Stockholders are requested to furnish proxies to be voted when the question of reorganization comes up. The stockholders on the committee are: John P. McEwan, W. J. Lowrie, F. E. Haarman, George Hutchinson and J. F. Stacy. They are represented by Attorney Louis Moos.

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Denneen Announces New Models

CLEVELAND, June 18—The Denneen Motor Co., maker of the Denmo truck, announces the following models: ¾-ton, model 12, three different types of bodies, $995, $1,020, and $1,065; 1¼-ton, model 10 chassis, $1,490; 2-ton, model 15, chassis, $1,790; and a 3-ton, model 14, at $2,325.

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A Statement from Bosch

NEW YORK, June 19—The following statement has been received by THE AUTOMOBILE from the Bosch Magneto Co.:

Ever since the entry of this country into the war, various rumors affecting the Bosch Magneto Co. have been in circulation, a number of them finding expression in print. It has been stated, for example, that the factories of the company were about to be closed down, that the company has been taken over by the Government, etc. It has been stated in print and otherwise that the Plainfield Works are to close down at once. This is not true, for while the production of starting apparatus will be suspended for the present, the company's orders and further prospective business indicate the necessity of continuing the Plainfield Works as an auxiliary in production to the manufactory at Springfield, Mass.—C. L. Schurz, President Bosch Magneto Co., New York.

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Marmon Gets Air Engine Contract

WASHINGTON, June 21—One of the first steps in connection with the appropriation of $600,000,000, which is now before Congress for airplane manufacture, is the letting of a contract to the Marmon company, Indianapolis, for the manufacture of 1000 airplane motors to be delivered in the next few months. The Marmon company is erecting a new factory for the manufacture of these which will have a total floor area of over 50,000 sq. ft. This factory is to be completed within 55 days. The motor to be built by the Marmon company is the Hall-Scott.

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Board Studies Airplane Standards

WASHINGTON, June 21—A meeting of the Aircraft Production Board is being held here to-day at which the standardizing of specifications for airplane materials, as well as standardizing airplane parts is being discussed. Among those present are: C. W. Manly of the Curtiss company; J. G. Vincent of the Packard company; H. M. Crane of the Wright-Martin company, and Messrs. Looning, Heath, Knabinshue, and Coker F. Clarkson of the S. A. E.

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Guaranty Corp. Changes Rates on Time Payments

NEW YORK, June 19—The Guaranty Securities Corp. has made a number of changes in its rates for handling time payment business on cars and trucks. The new rates took effect June 15. An advance of 1 per cent has been made on all certificates of deposit, and the minimum charges have been advanced under four of the five purchase plans. The lowest minimum, under the plan A for purchasing passenger cars, is unchanged at $15; under plan E, covering the purchase of trucks, the minimum charge is now $30; it was $20. Farmers' notes, maturing at harvest time, have been discontinued, and the company has also discontinued handling notes of single men between the ages of 21 and 30.

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Permalite Merges with W. L.

INDIANAPOLIS, June 18—The consolidation of the Permalite Corp. and the W. L. Battery Co., Poughkeepsie, N. Y., has just been completed. The company will be known as the Permalite Storage Battery Co., Inc., and will have offices both in Poughkeepsie, where the batteries will now be manufactured, and in this city. The company is establishing depots in all parts of the country for the exchange of batteries under the plan which permits a Permalite user to exchange his battery as often as necessary, for life, for a perfect, fully charged one, at a standardized fee which amounts to about the same as that for a charge.

Personals

WARREN, OHIO, June 19—R. E. Uptegraff has been appointed designing engineer of the Packard Electric Co. He will be in the transformer department. He will continue his work in the B. Rutherford Co., consulting engineering, in Pittsburgh.

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LANSING, MICH., June 18—D. B. McCoy has been engaged as advertising manager of the Olds Motor Works. Mr. McCoy was with the Oakland Motor Car Co. for a number of years and previously was assistant manager of the Kansas City branch of the Buick Motor Co.

A. L. A. Spetler, who has been manager of the Michigan branch of the Michigan Oldsmobile Co., wholesale distributer of Oldsmobiles for several States, has been made division sales manager of the Olds company, under the general sales manager. Spetler's territory comprises the central States and extends from Ohio to Colorado and from the lakes to the gulf. His headquarters will be at the factory.

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MINNEAPOLIS, MINN., June 19—The Ajax Rubber Co. has appointed W. J. Ryan as its supervisor in Minnesota, upper Michigan and northern Wisconsin, with headquarters here.

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DETROIT, June 18—L. A. Bachman has been appointed assistant purchasing agent of the J. C. Wilson Co. Mr. Bachman was formerly city buyer for the Chalmers Motor Co.

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PONTIAC, MICH., June 18—W. R. Tracy, assistant sales manager of the Oakland Motor Car Co., is going to Cleveland to take over the Ohio territory for the distribution of Oakland cars. A dinner was tendered to Mr. Tracy by executives of the Oakland company at the Detroit Athletic Club.

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ROCHESTER, N. Y., June 19—E. B. Osborn has been elected assistant treasurer of the Selden Truck Sales Co., assuming some of the duties held by G. C. Gordon, who has been president and treasurer of the company since its organization.

The sales of the company for May increased 261 per cent over the corresponding period of last year.

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WARREN, OHIO, June 18—N. A. Wolcott was elected president of the Packard Electric Co. at a recent meeting of directors, other officers elected being: Vice-president, Charles Fillius; secretary, R. E. Gorton; treasurer, N. A. Wolcott. The company has purchased a group life insurance contract, which insures the life of every employee for the amount of one year's salary. The insurance increases with salary increases, and provides for an increase of $100 for each year of service, with a maximum increase of $500.

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PONTIAC, MICH., June 18—F. L. Durbin has joined the Olympian Motors Co. as special representative for the State of New York. Mr. Durbin comes from the Dort Motor Car Co., for which he was engaged in similar work.

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DETROIT, June 18—C. W. Miller has been appointed general manager of the Michigan plant of the Detroit Steel Products Co., Cleveland.

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ST. LOUIS, MO., June 18—Carl W. Burst has been made general superintendent of factories for the Moon Motor Car Co., succeeding R. L. Eveland, who has been made manager of the Chadwick Six factory.

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DETROIT, June 18—Donald Schachinger has been appointed manager of the body building department of the Porter Mfg. Co., Ann Arbor, Mich. Mr. Schachinger was formerly with the Griswold Body Co.

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BUFFALO, N. Y., June 18—J. A. Coy, manager of the local branch of the Buick, has been transferred to the Detroit branch, succeeding C. C. Starkweather as manager. J. H. Browning, of the Chicago branch, is taking Mr. Coy's place in Buffalo.

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ATLANTA, GA., June 18—John Lottridge has taken the distribution in Georgia for the United States Motor Truck Co., Cincinnati. He was formerly general manager for Cuyler Lee, of San Francisco, handling Packard cars.

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DETROIT, June 18—The following men have been appointed representatives by the Wallace C. Hood Service Bureau: W. L. Smith, New England; E. E. Sheldon, entire eastern territory outside of New York; L. H. Oatman, northwestern Pennsylvania and northeastern Ohio, and E. A. Scheu, the Central West and the entire Western States clear to the coast.

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DETROIT, June 18—A. W. Mickim, formerly advertising manager for the Liberty Motor Car Co., has joined the staff of the Carl M. Green Advertising Agency.

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NEW YORK, June 18—The newly organized Harry Newman-Stratton Co., of Chicago, has closed a contract with the Rainier Motor Corp., of New York, whereby they become distributers for the northern part of Illinois, Wisconsin and the eastern part of Indiana for the Rainier worm-drive ½-ton truck.

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WASHINGTON, D. C., June 18—C. M. Baker has become a Colonel in the Quartermaster's Corps, U. S. A. Colonel Baker, as head of the purchasing division of the corps to which he is attached, was appointed to a full Colonelcy just before his departure for France, where he now is.

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NEW YORK, June 18—C. H. Larson, head of the Cutting-Larson Co., Oldsmobile distributer, has severed his connection with the Saxon Motor Sales Co., and his interests have been purchased by F. A. Gross, who has been elected president. Gross has been closely connected with the Olds Motor Works, Lansing, for the past 8 years, and has been branch manager in Buffalo, Boston and more recently in Chicago. General Manager George Morrow, of the Saxon company, has temporarily relinquished his duties and is traveling in the West. Both he and J. V. Hall, however, retain their interests in the Saxon company.

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DETROIT, June 20—Walter H. VanDeusen, director of sales and advertising of the Detroiter Motor Car Co., has resigned.

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DETROIT, June 20—Joseph E. Fields, sales manager of the Hupp Motor Car Co., has resigned to become manager of sales, advertising and service of the Liberty Motor Car Co. He receives a stock interest in the Liberty company.

O. C. Hutchinson, supervisor of branches for the Hupp company has been promoted to sales managership, succeeding Mr. Fields.

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DETROIT, June 19—Charles M. Hall has disposed of his interest in the Wetzel-Hall Co. of Detroit and New York. Mr. Wetzel purchased Mr. Hall's interest. Mr. Hall will continue actively with the company until Sept. 1 and then decide upon future plans. Charles M. Hall is one of the pioneers of the automobile industry, having graduated to it from the bicycle business at the time of its inception. He has previously been affiliated in executive positions with the Badger Brass Works, Kenosha, Wis., and the C. M. Hall Lamp Co., of Detroit.

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OBITUARY

SANDUSKY, OHIO, June 18—Tom W. Benoist was killed in a street car accident. Mr. Benoist, who has for years been one of the most successful aviators, had recently opened an aviation school and organized the Benoist Aeroplane Co. in this city.

Factory Activities

INDIANAPOLIS, June 17—The Nordyke & Marmon Co. to-day signed a contract for the construction of a one-story factory building, 100 by 350 ft., to be completed in 60 days, to provide additional facilities for the manufacture of airplane engines for the United States Government. The new building will be constructed on a 21-acre site just east of the present Marmon factory, and it is understood on good authority that bids soon will be received for the construction of a second building the same size of that for which plans were just announced. Officers of the company said they could not estimate at this time how extensive additions to the plant will be until it is known definitely how many engines are to be ordered by the Government.

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DETROIT, June 19—The Firestone Tire & Rubber Co. will erect a building of four stories at a cost of $500,000 in this city to be used for sales and stock purposes.

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STEVENS POINT, WIS., June 18—The Bukolt Mfg. Co., manufacturing Highway tire protectors, is preparing to establish a branch in Canada, at Portage La Prairie, Man., which is expected to result in the erection of a complete manufacturing plant at that point. The sales office will be opened at once, and business men of Portage La Prairie have undertaken to provide a suitable factory building which will make possible a production of 200 pairs of protectors daily, and employment of seventy-five skilled men. A new plant has just been completed in Stevens Point. Early next year the company will build a three-story structure, 50 by 100 ft., in which the offices and a club-house for employees will be combined.

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RACINE, WIS., June 18—The plant of the Racine-Sattley Co., which is occupied under lease by twenty-five separate industries, many of them making automobile parts and accessories, has been purchased by Logan Hay, of Springfield, Ill., for $300,000. It is said that present leases will not be disturbed for the present. The largest tenant is the Wallis Tractor Co. The plant covers more than two city blocks and is of brick, three and four stories high. When the Racine-Sattley interests consolidated their carriage and vehicle production at Springfield, Ill., the Racine plant was thrown open to leases in parcels.

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MINNEAPOLIS, MINN., June 18—The Moore Motor Vehicle Co. has purchased the abandoned freight car plant at Danville, Ill., and a force of men commenced work this week, placing the buildings and grounds in shape for operation of a branch manufacturing and assembling plant for automobiles. It is planned to commence assembling cars about July 1.

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CHIPPEWA FALLS, WIS., June 18—The Boone Tire & Rubber Co., Sycamore, Ill., and Des Moines, Iowa, has awarded contracts for the construction of the first unit of its new factory at Chippewa Falls. The building will be of fireproof construction, 100 by 200 ft., and will be ready about Aug. 1 or 15. The company plans to invest between $200,000 and $250,000 in the new plant, which will be its third.

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MILWAUKEE, WIS., June 18 — The Gemco Mfg. Co. is awarding contracts this week for the construction of a three-story factory addition, 50 by 150 ft., which will cost about $100,000 with complete equipment. The new factory will be practically a duplicate of the present main shop and will enable the company to double its production of bumpers, shock absorbers, jacks, lamps and many other accessories and devices.

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PONTIAC, MICH., June 18—An organization which will endeavor to improve the living and social conditions of the employees of the Detroit Weather-Proof Body Co. was organized here last week. The organization plans include the establishment of a restaurant on the premises of the company for the workers; gardening on vacant land near the factory, and the establishment of club, reading rooms, and so forth.

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BUFFALO, N. Y., June 18—The Curtiss Aeroplane Co. has leased space in three Buffalo manufacturing establishments in order to speed the work of building aeroplanes for the United States Government.

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CLEVELAND, June 18—The general offices of the Standard Tire & Rubber Mfg. Co. have been removed from Cleveland and are now at Willoughby, in connection with the factory there. This company has been manufacturing tires to the limit of its capacity since last October.

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MINNEAPOLIS, MINN., June 18—The trend of automobile business to include tractor lines is in line with the decision of the Minneapolis Steel & Machinery Co. to spend $325,000 to get ready to make engines for trucks and tractors in expectation of a heavy development and demand in the Northwest after the war. A space 175 by 600 will be utilized to test tractors, and a munitions factory building is to be turned to a tractor assembly plant.

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ALMA, MICH., June 18—The Republic Motor Truck Co. has advanced the price of its ¾-ton truck $100 and will advance all other models as soon as the costs are definitely estimated.

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ANN ARBOR, MICH., June 18—The Star Motor Co. plant will be sold to-day by the circuit court commissioner of this city.

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PEORIA, ILL., June 18—The Holt Mfg. Co. has been forced to adopt a new means of guarding the plant from spies. Every employee has been photographed and a print must be shown upon a pass before the applicant is admitted. No visitors are permitted.

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WATERTOWN, WIS., June 18 — The Lasure Clutch Co., Madison, probably will move its plant and offices to Watertown, the conditions being that local capital invest $20,000. The fund has practically been raised. The company manufactures clutch devices for all kinds of gasoline engines, principally for general purpose engines on farms.

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WASHINGTON, D. C., June 19—The War Department is now assigning medical officers to duty with the different automobile companies as a result of the vast amount of work which is being done by these companies for the Government. One of the latest companies to receive the services of a Government medical officer is the Ford Motor Co.

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PIQUA, OHIO, June 19—A company is being organized by the Piqua Chamber of Commerce and Chicago capitalists to build a tractor plant in this city. Recently successful tests of the Elgin tractor were made on a farm near Piqua. The Elgin is now ready to be put on the market. It is 10 ft. 8 in. long and 4½ ft. wide, and weighs approximately 2000 lb. It is provided with a four-cylinder engine.

P. W. Gillet and J. H. Latchford, Chicago, are interested. In all about $50,000 in stock has been subscribed. The company name may be changed to the Piqua Tractor Co.

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MILWAUKEE, WIS., June 19—It is reported that Duluth-Superior, the twin ports at the head of Lake Superior, are to be made the airplane producing center of the Northwest. Within 60 days the Ackerman Wheel Co., Cleveland, will establish an assembling plant in Duluth,

and as soon as possible a complete airplane factory costing about $200,000 will be erected.

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WATERTOWN, WIS., June 19—The Monarch Tractor Co., has booked more than enough orders to keep the plant busy for several months to come, and has been able to make satisfactory contracts for materials for at least 400 tractors to be manufactured by Jan. 1, 1918. The company loaded sixty-five tractors for Russia this week and is filling many domestic orders. Work has been started on the construction of a 20-12 and 10-6-hp. tractor to supplement the original line of 30-20-hp. machines.

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DETROIT, June 19—The Ford Motor Co., following instructions of the Government concerning alien enemies, has dismissed a large number of foreign workmen within the last few weeks.

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MILWAUKEE, WIS., June 18—The employment of women in places that always have been occupied by men is having exceptional growth in Wisconsin, and the automobile industry is taking an important part in the pioneering work that must be done to provide for the possible contingency of a great shortage of male labor growing out of the war.

The Nash Motors Co., Kenosha, already has started to place women in its core-room. In Milwaukee, the Cutler-Hammer Mfg. Co., Geuder, Paesche & Frey Co., and other large concerns closely identified with the automobile parts and equipment industry not only are employing women in the shops in places usually filled by men, but they are advertising in the newspapers for more women for such purposes. The Allis-Chalmers Mfg. Co., Milwaukee, now employs a large number of women on mica-winding and other electrical construction of a light nature.

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ST. JOHNS, MICH., June 19—The Triangle Motor Truck Co. held a meeting of stockholders this week and arranged for the erection of a factory. The company has a capital stock of $50,000 of which $32,500 was subscribed last Friday night.

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PRODUCTION

DETROIT, June 18—Thursday, June 14, was a record day at the Ford Motor Co. plant, as it witnessed the production of the two-millionth model T Ford engine, the Ford Motor Co. having manufactured exactly 2,000,000 of its engines between the time of its inception and last Thursday.

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DETROIT, June 14—The Ford Motor Co. produced in May 83,616 cars, averaging 3216 a day, or better than 2 a minute. May 19 was the biggest day of the month, when 3496 cars were built. The company is making 2500 ambulances for the Government.

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NEWTON, MASS., June 21—The Stanley Motor Carriage Co. reports business as unusually good. Deliveries for the past 6 months show an increase of 200 per cent over the same period a year ago.

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DETROIT, June 18—The Maxwell Motor Co. produced and shipped 10,000 cars in May, a new record. On several days the shipments reached 500, the record daily output, however, being 626 cars.

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TOLEDO, June 19—The Willys-Overland Co. manufactured 16,015 cars in May. Present indications are that the company will manufacture 100,000 to 110,000 cars in the first 6 months of the current year.

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TOLEDO, OHIO, June 16—The Toledo Screw Products Co. has received a contract from the United States Government for 1,000,000 1-lb. shell pieces. The company states that this contract will in no way interfere with its normal business activities and that regular production and prompt delivery will continue.

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WAYNE, MICH., June 18—The Harroun Motors Corp. commenced assembly of its product last Saturday and began shipment to-day. The first day's shipment amounted to twenty-five cars.

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CINCINNATI, OHIO, June 15—Sales of the United States Motor Truck Co. for the first quarter of this year totaled $1,672,000.

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PHILADELPHIA, June 15—During May the Vim Delivery Co. built 1582 vehicles and sold 4247.

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ROCHESTER, N. Y., June 18—May business of the Selden Truck Sales Co. increased 261 per cent over the corresponding month last year. Production broke all records in the history of the company.

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Pullman Plant Sale Held Up

YORK, PA., June 16—Exceptions having been filed, the proposed sale of the plant of the Pullman Motor Car Co. by the receivers to the National Products Co., has been held up at least temporarily. Creditors of the company, represented by Attorneys Harvey A. Gross and Fred B. Gerber, of this city, on Friday filed their exceptions in the United States district court at Scranton, and Judge Witmer, upon the request of the receivers, William A. Keyworth, Carlton L. Hoff and Henry D. Schmidt, of this city, will fix an early date for the hearing.

The National Products Co. agreed to purchase the plant and assets of the company, excepting the accounts and bills receivable, for $260,000. This sum the exceptants say is not enough, and another bid has been made, one of $315,000, by Samuel Winternitz & Co., of Chicago and Detroit.

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Fisk Offer for Gibney Plant

PHILADELPHIA, June 14—An offer has been made by the Fisk Tire & Rubber Co. for the purchase of the Gibney Tire & Rubber Co., Conshohocken, Pa., now in the hands of a receiver. It is reported that at least two other concerns of national importance have made offers. There is reason to believe, however, that the company itself will make an offer, and that it will be higher than the rest. The bids will be submitted to the United States district court in this city about June 25, and final adjudication will be made on July 10.

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NEW COMPANIES

DOVER, DEL., June 18—The Boyd Motors Corp. has been incorporated in this State, with a capital of $5,000,000, to manufacture engines of the valveless type for automobiles and aeroplanes.

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CELINA, OHIO, June 18—The Beam Airplane Co. has been incorporated, with a preliminary capital of $10,000 to manufacture airplanes. The incorporators are: J. C. Dibadall, Herman F. Cron, G. A. House, H. J Beam, Lester Miller, Lee Crawford and B. Ward Beam. It is planned to establish a plant in Celina for the manufacture of the Beam airplane.

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QUINCY, ILL., June 18—The Niswader Mfg. Co. has been incorporated with a capital of $7,000 to manufacture and deal in demountable rims for automobiles. The incorporators are John L. Niswader, Harry L. Bert and Fred C. Scholz.

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DETROIT, June 19—The Royal Motors Corp. has been formed to manufacture and market a unit for converting the Ford car into a 1½-ton truck. J. C. Siemon is president, other officers being: Secretary-treasurer, George D. Gray; sales manager, L. J. Kaiser, former sales manager of the Detroit Chair Mfg. Co.

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TRENTON, N. J., June 19—Dural Rubber Co., capital $200,000, has been incorporated here to make airplane and automobile tires and tubes as well as other rubber accessories. Incorporators are: State Comptroller Newton A. K. Bugbee, Frederick F. Katzenbach, Edgar H. Wilson, G. F. Ginlen, James C. Tattersall, H. M. Voorhees, John J. Connor, John E. Gill, W. C. Ehrenfeld, S. E. Kaufman, Leon Kaufman, Caleb S. Green and Asher Wilson.

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PHILADELPHIA, June 19—Great American Truck & Tractor Co., capital $250,000, has been formed to make and sell automobiles, trucks and tractors by J. H. Theobald, E. Franklin and G. King Franklin, of Chicago.

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DIVIDENDS DECLARED

Stanley Motor Carriage Co., 7 per cent on preferred payable July 1 to stock of record of that date.

Edmunds & Jones Corp., quarterly of 1¾ per cent on preferred and $1 a share on common, payable July 2 to stock of record June 20.

The Chandler Motor Car Company of Cleveland has declared an extra

special Red Cross war dividend of 1 per cent, payable July 1 to stock of record June 26.

The intention of the board is that this will not in any way interfere with the contemplated dividend Oct. 1 of 2 per cent and 1 per cent extra.

A separate check is to be sent with endorsement to the Red Cross, with the suggestion from the company that it be turned back to the company in order that it may be made in one lump sum from the company to the Red Cross.

Electric Storage Battery Co., 1 per cent from net earnings on common and preferred, payable July 2 to stock of record on June 18.

Autocar Co., special Red Cross war dividend of 1 per cent, $20,000, payable June 19 to stock of record.

Selden Truck Sales Co., 5½ per cent on preferred.

Keystone Tire & Rubber Co., quarterly of 2 per cent, with additional ⅓ per cent on preferred, and regular quarterly of 3 per cent on common, payable July 2, to stock of record June 22.

Hupp Motor Car Corp., quarterly of 1¾ per cent on 7 per cent cumulative preferred, payable July 2, to stock of record June 20.

Standard Screw Co., 6 per cent on common, payable July 2 to stock of record June 18. Also semi-annual of 3 per cent on preferred A stock and 3½ per cent on preferred B stock, payable July 2 to stock of record June 18.

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CHANGES IN PRICES

Car	Model	Old Price	New Price	Effective
Oldsmobile	8, 5-Pas.	$1,295	$1,467	July 1
Oldsmobile	8, 7-Pas.	1,367	1,467	July 1
Oldsmobile	8, Club-Rdstr.	1,295	1,467	July 1
Oldsmobile	8, 5-Pas.	1,095	1,185	July 1

Note—Has discontinued manufacture of five-passenger eight-cylinder model 45.

Motor Issues Are Stronger

Promise of Large Government Contracts Causes Flurry on Stock Exchange and Curb

NEW YORK, June 19—Automobile and accessory securities yesterday were in large demand, with very active trading as a result. The automobile industry is expected to have a large share in government work. The automobile stocks were among the most prominent features all through the day. General Motors advanced 5½ points to 116 and Studebaker rose over 4 points to above 86. The accumulation of Studebaker attracted most attention. Word was given out yesterday of a large government contract having been received by this company.

Saxon Motors Weak

Saxon Motors showed considerable weakness last week, dropping to 29 on Monday. This stock was brought out at 65 and quoted as high as 87 last year. It has declined about 20 points in the last 2 weeks. Yesterday the directors of the company decided to defer action on the quarterly dividend until July 24. The stock is on a 7 per cent basis.

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Ajax May Earnings $319,588

NEW YORK, June 15—Net earnings of the Ajax Rubber Co. for May were $319,588, or at the rate of $3,835,044. For the 5 months ended May 31 net earnings were $1,102,684, or at the annual rate of $2,646,444. The returns for May were the largest in the history of the company for a similar period. For the 5 months the company earned $7.76 a share on its stock, or at the annual rate of $18.60 per share.

At a meeting of the board of directors last Tuesday, it was decided to appropriate $450,000 for improvements, additions, etc., in order that the capacity of the plant may be increased. The company is now over 100,000 behind its deliveries of tires and tubes. Less than 3 per cent of the tires manufactured by the Ajax company go to the manufacturers, the rest being sold direct to the public.

The company has also decided in favor of buying $100,000 worth of Liberty Loan bonds. This is in addition to $30,000 or $40,000 subscribed for by employees of the Ajax company.

—

Crude Oil Up 10 Cents in California

SAN FRANCISCO, June 18—The Standard Oil Co. of California has advanced all grades of crude oil 10 cents a barrel in the San Joaquin Valley, Ventura County, and Whittier, Fullerton and Santamaria fields, over prices announced on May 11.

—

New Ohio Laws Provide Severe Penalties for Violations

COLUMBUS, OHIO, June 14—One of the new Ohio automobile laws permits the courts to revoke licenses of owners violating speed laws, failing to stop after an accident or operating a motor vehicle while intoxicated. For the second offense the courts can revoke licenses for a period not to exceed 2 years. This is the most drastic provision against lawless drivers that was ever enacted in this state. This law is effective July 2.

Another law raises the speed limit on

Automobile Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	68½	70	..
*J. I. Case T. M. Co. pfd	84	85½	..
Chalmers Motor Co. com	9	13	—1
Chalmers Motor Co. pfd	..	..	..
*Chandler Motor Car Co	88	92	—1
Chevrolet Motor Co	95	99	—3
Fisher Body Corp. com	35	38	..
Fisher Body Corp. pfd	85	90	—2½
Fisk Rubber Co. com	74	76	—4
Fisk Rubber Co. 1st pfd	103	106	..
Fisk Rubber Co. 2d pfd	92	95	..
Firestone Tire & Rubber Co. com	123	125	—2
Firestone Tire & Rubber Co. pfd	105	107	—1
*General Motors Co. com	111	112	+2½
*General Motors Co. pfd	87	89	—1
*B. F. Goodrich Co. com	51¾	52	— ⅝
*B. F. Goodrich Co. pfd	106½	108	—1
Goodyear Tire & Rubber Co. com	193	196	..
Goodyear Tire & Rubber Co. pfd	106	108	..
Grant Motor Car Corp	3	5	..
Hupp Motor Car Corp. com	3	4	..
Hupp Motor Car Corp. pfd	72	80	..
International Motor Co. com	5	10	..
International Motor Co. 1st pfd	30	50	..
International Motor Co. 2d pfd	10	20	..
*Kelly-Springfield Tire Co. com	48½	51⅞	—1
*Kelly-Springfield Tire Co. 1st pfd	87¼	95	— ¾
*Lee Rubber & Tire Corp	18¼	18¾	+ ¼
*Maxwell Motor Co., Inc., com	48½	49	+ ¼
*Maxwell Motor Co., Inc., 1st pfd	65	66	..
*Maxwell Motor Co., Inc., 2d pfd	31	31⅞	..
Miller Rubber Co. com	185	194	—5
Miller Rubber Co. pfd	102	105	..
Packard Motor Car Co. com	..	151	..
Packard Motor Car Co. pfd	95	98	..
Paige-Detroit Motor Car Co	29	31	..
Peerless Truck & Moor Corp	16	18	+1
Portage Rubber Co. com	140	150	—12
Portage Rubber Co. pfd	..	..	..
Regal Motor Car Co. pfd	..	22	..
Reo Motor Car Co	28	29	..
*Saxon Motor Car Corp	29	30	—12½
Springfield Body Corp. com	52	57	..
Springfield Body Corp. pfd	110	117	..
Standard Motor Construction Co	12	13	..
*Stewart-Warner Speed. Corp	74	75	..
*Studebaker Corp. com	82⅛	82¼	+ ⅜
*Studebaker Corp. pfd	101	104	..
Swinehart Tire & Rubber Co	65	70	..
United Motors Corp	27¾	28½	+ ¼
*U. S. Rubber Co. com	60	60½	—1¼
*U. S. Rubber Co. pfd	107⅛	107¾	+1⅛
*White Motor Co	46	47	— ¼
*Willys-Overland Co. com	31	31¼	+2¼
*Willys-Overland Co. pfd	94	94¾	+1½

*At close June 18, 1917. Listed New York Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co	..	29	..
Bower Roller Bearing Co	..	39¾	..
Chevrolet Motor Co	91	99	..
Commerce Motor Car Co	..	..	..
Continental Motor Co. com	7½	7⅝	— ⅛
Continental Motor Co. pfd	..	..	..
Edmunds & Jones Co	..	..	..
Ford Motor Co. of Canada	220	245	..
Hall Lamp Co	21	..	..
Hayes Mfg. Co	..	..	..
Michigan Stamping Co	..	15	..
Motor Products	..	..	..
Packard Motor Car Co. com	..	..	..
Packard Motor Car Co. pfd	..	..	..
Paige-Detroit Motor Car Co	30	30¾	— ½
Prudden Wheel Co	20	24	..
Reo Motor Car Co	28½	29	—1

INACTIVE STOCKS

Atlas Drop Forge Co	38	41	..
Kelsey Wheel Co	..	49	..
Regal Motor Car Co	..	26½	..

country roads from 20 to 25 miles per hour. This law is effective July 1.

Another important new law passed is: "It shall be the duty of every person who operates, drives or has upon any public street, avenue, highway or bridge a vehicle on wheels, during the time from 1 hr. after sunset to 1 hr. before sunrise, to have attached thereto a light or lights the rays of which shall be visible at least 200 ft. from the front and 200 ft. from the rear. Provided, however, that this section shall not apply to a vehicle designed to be propelled by hand or to a vehicle designed principally for the transportation of hay or straw while loaded with such commodities. A person violating the provisions of this section shall be guilty of a misdemeanor and shall be punished by a fine not to exceed $25." This law is effective June 26.

Another law provides imprisonment in the penitentiary not less than 1 year nor more than 15 years for buying or receiving motor vehicles known to have been stolen. This law also applies to persons concealing a motor vehicle thief and is effective July 1.

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292,000 Cars in Ohio

COLUMBUS, OHIO, June 19—According to the report of Ohio Registrar of Automobiles McCurdy up to June 8 there were 292,000 gasoline cars registered in Ohio. During the same period the number of electrics registered was 4400, and 3400 manufacturers and dealers were registered. Receipts of the department up to that time were approximately $1,600,000, which is far in excess of the amount taken in up to this time in any former year. Transfers of licenses from one car to another, permitted under a recent law, have numbered 3400, and hundreds are coming in every day, indicating many new cars being purchased.

It is estimated that almost 350,000 cars will be registered in Ohio this year.

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184,126 Cars in Michigan

LANSING, MICH., June 18—Up to June 1 of this year 184,126 automobiles were registered in Michigan. Last year the total number was 160,052.

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150-Mile Race for Omaha

OMAHA, NEB., June 18—An automobile race meet is scheduled for the local 1¼-mile speedway July 4. There will be a 150-mile race for cars of 300 cu. in. or less. A 50-mile race for cars of the same capacity is also planned. The prize money will amount to $10,000.

—

Match Race for Uniontown

UNIONTOWN, PA., June 19—Louis Chevrolet, Ira Vail, Earl Cooper and Louis Fontaine have been matched for a four-cornered race for a $5,000 purse at the local speedway on July 4. In addition the program consists of a 122-mile dealers' race and a four-cornered Australian pursuit race among the four fastest cars in that event.

12,800 Cars for R. M. States

21 Per Cent Increase Over 1916 Registration of 60,224 for Wyo., N. M., and Colo.

DENVER, COLO., June 18—The three Rocky Mountain states comprising the territory supplied by Denver distributors are counted upon to buy 12,800 cars this year. Wyoming and New Mexico are expected to take 3000 each and Colorado the other 6800. This number of sales would mean a gain of only 21 per cent over last year's total registration of 60,224 for the three states, while that figure showed an increase of 22,677 cars, or 60 per cent, over the 1915 registration of 37,547. Several dealers, highly optimistic on account of last year's heavy sales and present cheering prospects, predict a far bigger gain for 1917 than the carefully studied estimates made by officials of these states, who have aimed to be extra conservative in furnishing figures for THE AUTOMOBILE. They have sought to leave ample margin for any emergency that might upset the motor car business in their respective states. In New Mexico, for example, the registration for only 2½ months of this year, which is 9045, is 817 cars beyond the total number registered in 1916.

Steady Growth in Industries

There is no big boom of industry and wages here such as has developed in eastern manufacturing centers handling immense orders for war materials, but there is a steady, vigorous growth in the main industries of the territory and the motor trade is getting its share of benefit from the added wealth produced. While the purchase of cars is not nearly so extensive among wage-workers here as in some parts of the nation, still there are occasional sales to mechanics, school teachers, clerical workers and others not far up in the financial scale, and car ownership is becoming established among a wider range of classes than it was 3 or 4 years ago. In this particular territory a large part of the gain in sales duing the last year or two has been among farmers and stockmen, and this situation promises to continue throughout this year at least, and likely to a considerably more marked degree.

There is now one car for every twenty-six of the district's 1,565,000 people, and the ratio is growing more rapidly in the rural sections than in the cities. This combined population, according to the latest census estimates for the three states, is distributed as follows: Colorado, 975,000; New Mexico, 400,000; Wyoming, 190,000.

The following is a record of the total number of cars registered the last 3 years in each state:

	1914	1915	1916
Colorado	18,433	28,571	44,871
New Mexico	3,090	5,000	8,228
Wyoming	2,428	3,976	7,125

In all this vast territory of mountains, plains, plateaus, forests, lakes, rivers, farms, ranches, orchards, irrigation systems, metal and coal mines, mills, smelters, oil wells and refineries, factories, medicinal springs, waterfalls, entrancing canyons, noted fishing streams, big-game wilds, scenic highways and world-famed national parks—in these three states combined, including one city of 250,000, there are about one-third as many people as in the city of New York. But these three states provide an automobile market of truly tremendous growth possibilities. They have rich resources yet to be developed, and they are steadily gaining settlers and investors. While the thousands of square miles of higher and rougher mountain regions will for centuries, and perhaps forever, prevent these states from becoming thickly settled, these same mountains contain billions of dollars in mineral, industrial and scenic wealth, and they will always hold out a glorious invitation to congested districts everywhere to come out into the Rockies for fresh air and real rest.

Colorado Increasing Production

In crops, Colorado shows a 1916 production valued at $106,453,000, a gain of $34,480,000 over the value of the 1915 output of $71,973,000. Wyoming produced 8,030,000 barrels of oil in 1916, worth $40,150,000, a gain of 2,030,000 barrels and $10,150,000 over 1915. Official figures on New Mexico industrial output could not be secured, but that state's bank clearings of $14,480,516 for 1916 were $4,140,330 above the $10,340,186 for 1915. Wyoming's output in mining, agriculture, livestock and manufacturing also showed substantial gains, the total production of all industries being valued at $140,233,678 for 1916 as against $115,817,333 for 1915, while the assessed valuation of property made a growth of nearly $17,000,000 during that year. In the same period, Colorado gained about $12,000,000 in manufacturing output, nearly $14,000,000 in livestock and $37,864,863.37 in bank deposits. Seventeen new state banks were established in Colorado during the year, representing a total capital stock of $7,313,100, while the total resources alone of the banks under state supervision are now more than $78,000,000, or double that of 6 years ago.

Farm Products High

Colorado farmers last year sold ordinary potatoes at 1¼ to 3¼ cents a pound and fancy grades as high as 4 cents, while the highest price in 1915 was 1¼ cents—equal to the lowest for last year's crop. Onions have brought as high as 10 cents a pound, fully 200 per cent higher than the 1915 price, and some farmers with a big onion crop have talked of buying an extra car as an irresistible inducement for capable and steady farm hands. Incidentally, the chief wage increases have been obtained by farm hands and metal miners. Apples have sold at an exceptionally high figure, at least a third more than the year previous, and other soil products have brought similar gasoline-burning returns.

The Automobile

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Post-War Exports

WAR is proving the mother of inventions, and in Europe these inventions are taking a new turn in automobile manufacture. One of the latest suggestions is that certain countries are going to produce one model of automobile for export only. Instead of each automobile concern attempting to manufacture its own export models there will in reality be only one export model representing the entire country. The reason apparently lies in the fact that European countries will find it very difficult to manufacture one model that will do for European trade and also for export to countries with relatively poor roads. The European buying clientèle is especially fastidious, demanding low clearance, small motors and other essentials. Conditions are quite different in many other countries to which they would export and the solution seems to lie in what might be designated a national model for export purposes.

War has certainly accomplished great things, if it has done nothing more than to set the human mind thinking along such Utopian plans of co-operation.

When American makers are laying their plans to meet post-war competition in export trade, they will have to get together. America has a good lead on the old world in production, but it will not be sufficient to offset some of the suggested plans of intensified co-operation of European makers without getting together. It is unfortunate that the Webb bill, making possible co-operation among manufacturers in export trade, did not pass and become a law last year. There is certainly need for such a measure at present, and the Senate should follow as soon as possible the example of the House, which voted in favor of it last week.

But the Webb bill, or other similar legislation, will not alone bring to our manufacturers the great export trade awaiting them. Every manufacturer in the automotive industry must study the effect of the war on requirements in foreign countries and must shape his product to meet those requirements. He cannot continue to supply the same goods indefinitely. Markets change rapidly in these war times and our readiness in adapting ourselves to such changes will determine to a large extent the scope and value of our export business in the future.

The Right Stand

ATTEMPTS on the part of ambitious inventors, aided and abetted by unscrupulous attorneys, to mulct big manufacturers of large sums have been all too frequent in the past, and a number of such suits are now pending in the courts of various states.

The usual procedure is to claim precedence on some one of the six thousand parts of an automobile; institute suit for damages in which a million is usually the minimum; then, by a flanking movement, obtain an injunction and thereby tie up millions of dollars' worth of materials in process of manufacture in the hope of forcing the maker to a cash settlement.

In the past, manufacturers confronted with this alternative have often deemed it best to settle rather than to suffer the tremendous loss of closing the factory while the suit could be tried. In most cases settlement can be made for a small fraction of the damages claimed in the suit.

This method proved, however, to be only an additional encouragement to the practice, with the result that manufacturers are now resolved to carry such contests through the courts regardless of cost or inconvenience.

Straight-Cut Fuel

ONCE again a carbureter engineer voices the opinion that the straight cut fuel, that is, neither gasoline nor kerosene, but a mixture of the two, is what will have to be used before long. All our carbureter manufacturers are preparing for this, all are ready with some device to take care of such a situation. That we will be able to use straight cut fuel without a loss in volumetric efficiency is very unlikely. If we must employ a lower mean effective pressure the compensation must come by applying some of the principal features of air engine design so as to keep the weight to power ratio from increase. If we must have larger engines for the same power, they need not be heavier; in fact, if the m.e.p. is lowered they might even be lighter though bigger. Slowly, but surely power per unit of total vehicle weight is coming to be more considered than power per cubic inch of engine.

America Is Fighting for Its Life

Our Country Must Continue To Live on a Basis of Common Consent, Not Upon Imposed Power—Man Who Labors with His Hands Makes Modern Civilization

By Franklin K. Lane
Secretary of the Interior

¶EDITOR'S NOTE—America is fighting Germany, Secretary Lane asserted in his address before the Editorial Conference of Business Papers in Washington, because, by her violations of our rights, she insisted we should fight her. She has demonstrated that she represents government by the soldier, which is not consistent with our ideal of government by consent of the people. We are compelled to fight in order to save our national life.

THE department of Government that I represent has to do with the sources from which we are to draw for the carrying on of this war in no inconsiderable part, but I do not know that it is worth while, in talking to a body of men such as yourselves, to speak of the resources of the United States, of our mines, of our ores, of our lumber, of our lands, of our waters, of our inventors, of the genius of our people that has solved the difficulties of 150 years of life. I think I had rather talk with you very directly and very simply about the larger question.

Why Are We Fighting Germany?

I think, perhaps, I can serve you best and serve the country best by answering a question or two that may be in your minds. The size of this war no one can magnify; no one has the mind that can grasp figures such as this war involves—a war with forty million people in arms, a war in which fifteen million people have passed over to the great beyond, a war in which it has been necessary to mobilize every resource of every country on the face of the round globe. Nothing comparable with it has ever been dreamed of by man; and we are a part of it now, and why are we a part of it? I find that people have short memories; I find that we are a kindly and a sympathetic people, who cannot maintain in ourselves a consciousness of bitterness for any length of time. I find the question constantly put, "Why are we fighting Germany?" And I find too a difficulty in the minds of many to realize the abstraction "Democracy." How is Democracy imperilled? Why should I send my boy to France to fight for Democracy? Why should you spend all your tens of thousands in a fight for this abstraction, Democracy? It took us over two years on this side of the water to understand the significance of this war. We saw Belgium invaded; we had sympathy for Belgium. Belgium was a little country; Belgium was a country that had done no harm to any one, and our heart went out to Belgium. We saw Liége and Louvain, and we heard Cardinal Mercier, but we did not understand their significance. That is the plain fact.

But now, after two years and a half, in which the whole purpose of Germany has been developed, we can plainly see that translated into American history, and the terms of our past, Liége stands for Bunker Hill and Louvain for Lexington, and Cardinal Mercier is a Patrick Henry.

We saw France invaded, outraged, desecrated, partly ruined, and we have seen one million three hundred thousand Frenchmen lay down their lives to save the land of Lafayette, and yet we did not realize, at the beginning, the significance of that invasion or the outrage that was put upon France. France, we must always remember, was the first land in Europe—in the world—to follow the lead that we gave in standing for free institutions, and in raising high the banner of liberty, equality and fraternity. France followed our example. She, as a child of freedom, is our child; but yet we did not go to her rescue, because France was far away; France was involved with a neighbor with whom she had antipathies, but we had not learned what the significance of the invasion of France was. And we have sympathy with England, because the laws and the traditions and the standards of living that we have and that are called Anglo-Saxon civilization came from England, and because of another reason—that we fought England twice—once upon the sea and once upon the land—and defeated her both times, and out of our fights England has learned what she cannot do to colonies; and for that reason, and that reason alone, Australia and New Zealand and Africa and Canada are fighting to-day with her for the freedom of the seas.

Significance of New Movement in Russia

And we understand the significance of this new movement in Russia. Why is it that they look with favor upon Americans in Russia? It is because this new Russia that we see to-day is a Russia based upon the principles that Washington and Jefferson and Lincoln taught, and the thing that those nations are fighting for is the thing that we have taught the world. That is the reason that we have sympathy with them; but our sympathy was

not enough to involve us in this war, because we had a traditional policy that was against taking up the quarrels of other peoples.

We are fighting Germany because Germany insisted that we should fight her; she violated all our rights, she attacked us, and we saw, as time went on, that there would be no freedom for us, that Bunker Hill and Lexington and all the proud names of the past would be idle, valueless, unless we were willing to assert our duty, if you please; unless we were willing to let our sympathies take concrete shape, and support the principles in which we believe, so that there might be freedom upon the land and freedom on the sea as well.

People say these things are of the past—Belgium and France and Russia and the Lusitania and the Sussex—that those things are all of the past—why bring them up now? My friends, those who talk in that way simply fail to realize that the philosophy, the purpose, the determination of Germany could not be realized by the world until Germany showed to what extent she would go. Belgium and the Lusitania and the Sussex are but bits of evidence which, put together, bring forcibly to the mind this one thing: That government by the soldier is not consistent with government by the people.

Government by the People Must Live

Germany is a great power; the Germans are a wonderful people; but Germany has a will to rule that is inconsistent with our determination that Government by the people shall live.

Germany is a combination of two things—of a survival and of an invention. She is a combination, in her government, of the feudalism of the thirteenth century combined with the inventive genius and the organization and the methods of the nineteenth century. Feudalism plus science is what she represents, and feudalism plus science is fighting to-day against Democracy plus science, and we must determine which shall be the dominant one on the face of the earth, because they are irreconcilables—just as irreconcilable as slavery on the South and freedom on the North. And they are willing to go to any length in order to see that their philosophy persists. Leave them alone, within their own territory; we have no quarrel with Germany's desire to develop as Germany; but we know perfectly well now that the system which she represents is one that makes for the aggressive conquest of the world, just as surely as the system that Mahomet tried to carry out centuries ago—and Mahomet tried to carry out his system by methods that were as far from the civilized standards of his day as are the methods that Germany has attempted from the methods of our day—the dropping of bombs from dirigibles upon harmless civilians, the submarine striking in the dark at harmless women and children, the scattering of all kinds of evils in the name of war.

The very fiend of war himself would not stand for those things that have been done in his name during these past two years.

It may be wrong for a people to be governed by their hearts; it may be that we should not allow our sympathies to be aroused, but there comes a time when we realize that sympathy develops into self-interest, and when you review the situation as it exists in Europe, and as it has existed, no man can seriously deny that our interest as a nation and as a democratic people are involved in this war, because the power that would ruthlessly tear up a treaty with Belgium, that would invade France, that would do the things that have been done to a neutral nation—indeed to all neutral nations upon the seas—that power would certainly demand from an overwhelmed England, Canada on the north by way of indemnity. Then our three thousand miles of border would be threatened for all time to come.

Fighting Against Imposed Power

So I would impress upon you not merely to take the idealistic view of this war—a view robustly stated by the President, and in every way appreciated and eulogized by the people of this country and of Europe—but take the very practical view; look at America and America's interest, and when you come to deal with the hard technical problems upon which you men write from week to week, put into your editorials the understanding and the thought that America is not fighting merely for an ideal; that America is fighting for something that is extremely real, that is vital to us; that we do not wish to go back to the day when one man can impose his will upon a hundred million men; that we wish our country to continue its life upon the basis of common consent, and not upon imposed power; that the man who is in khaki to-day in the United States or in Europe shall not continue to be the master of the fortunes of this continent or of any other continent; that the civilian, the man who works with his hands in the mine or on the farm or in the factory or in the office, is the man who makes modern civilization, and that we are fighting for his right to live.

We Cannot Revert to Feudalism

So when you appeal in your papers to the coal men to make a fair price on coal, when you appeal to the railroad men to give cars so that traffic can move, and to make their rules so that the service that the country needs can be given, when you appeal to the copper men to come along with their supply, when you appeal to the farmer to develop larger crops, when you appeal to the warehouseman to handle his business so that we will not be the subjects of speculation, when you appeal to all the business interests of the United States—the great interests of the United States that you represent, you will have behind you always the thought that we cannot revert to the old day of feudalism and monarchy, and that we are fighting for the thing that was born in the United States, and that the world has followed, and that now that a great power of supreme genius has risen to organize militarism as it never was organized before, and to impose a new form of government upon the world, and to dominate it by its will, that we stand beside those who have followed our example in

opposing the extension of that principle of feudalism and that we stand for a people that are free and for a government that is based upon the consent of the governed. If you will have in your souls that idea, then the people of the United States will be fired, as they are not fired to-day, with a feeling that this fight is their fight; that it is not far off across the water and upon neighboring continents, but is a thing vital and real to the people of the United States—as real as the war between the states, more real than the war with Spain, and as real as the War of the Revolution, and that we are willing to make the sacrifices that those men made. I saw the other day at Yorktown a simple gravestone, and on it were these words, "Thomas Nelson, Governor of Virginia. He gave his all for liberty." And that is the proudest eulogy that any man can have.

Moto-Meter for Airplanes

New Type Produced for Instrument Board of Planes and Motor Boats—Registers Water Temperature Accurately

THE Boyce Moto-Meter Co., Long Island City, N. Y., has for some time been working on a temperature indicator which will show the condition of the water in the jackets of an airplane motor. For this service an indicator graduated in degrees, which will read with considerable accuracy, is desired, and it is seldom possible so to mount the standard form of Moto-Meter in such a position that the pilot can read it.

Simple in Principle

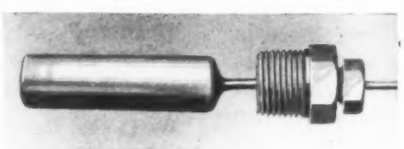
The airplane indicator, which is just ready, is therefore arranged so that it can operate a hand moving over a temperature dial on the instrument board of the plane, showing all degrees of temperature up to boiling. It is extremely simple in principle, but needs accurate manufacture.

There are two main elements. In the water, probably at some point in the cylinder jacket, or in one of the water pipes, is a small cylinder containing air. From this a fine bore copper pipe connects to a diaphragm box inside the instrument board fitting. As the engine heats up, the air expands and forces the sides of the diaphragm box apart and the expansion of the box operates a lever which moves the indicator needle over its dial.

Eliminating Air Expansion

An extremely ingenious detail is the way in which the expansion of the air inside the connecting pipe is eliminated. If the volume of the air in the cylinder that goes in the water is very large compared to the volume within the diaphragm box and the pipe considered together, then changes in atmospheric temperature will not produce enough total alteration in volume of contained air to cause the needle to move. It is not possible to obtain copper pipe that is immune from kinking with a bore little more than miscroscopic, so the happy expedient of running a piano wire through a pipe of fairly large bore was hit upon. The wire is just a free fit in the pipe, leaving an effective air space of minute total volume.

In the sectional diagram the method by which the expansion of the box moves the needle is shown. The slotted lever end engages a quick pitch screw thread on the needle shaft and the lever is moved on its pivot as the side of the expansion box moves. Original adjustment is effected by altering the position of the little pin that is seen between the box and the disk on the lever. When this pin is close to the fulcrum the needle movement is increased and vice versa.



The instrument board dial and the expansion cylinder that goes in the water

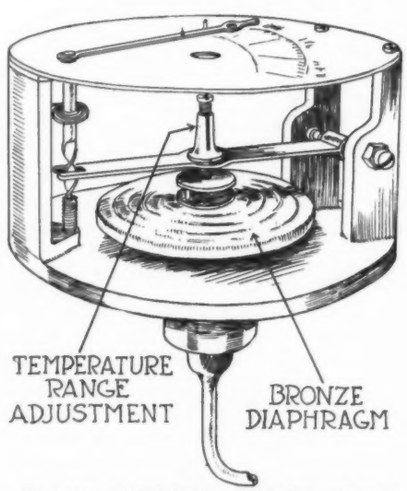


Diagram of internal mechanism of new type moto-meter

Lever of Dissimilar Metals

Notwithstanding the small capacity of the diaphragm box great changes in air temperature would still affect the reading to some slight extent, so to compensate for the last degree of inaccuracy the lever or cross bar which operates the needle by means of its slotted end is made of two dissimilar metals. The rate of expansion of the components of the lever is different, so while straight at normal temperature, 70 deg. Fahr., it bends either one way or the other as temperature rises and falls. If the temperature rises the air inside the diaphragm box expands and lifts the lever, so tending to move the needle, but the lever then bends downward, automatically neutralizing the movement of the diaphragm.

The new form of meter is essentially intended for use where the place where it is desired to know the temperature is some distance from the position where the operator can read the dial easily, so it is to be supplied with a considerable length of pipe. At present either 4 ft. or 12 ft. is the standard length, and the whole outfit, with either the short or the long pipe, sells for $20.

Shows Unexpected Conditions

Mr. Boyce, the inventor of the new instrument, informs us that he has found some interesting effects by applying the apparatus to different engines. Mounted in the outlet pipe from the cylinders of a motor with syphon it was noticed that the needle oscillated continually from about 200 deg. up to 212 deg., showing that the water in the engine was boiling though it was not doing so in the radiator. Also it showed that there is often a considerable difference in temperature between the rear and front cylinder jackets in one block.

S. A. E. Papers Are All Pertinent—

Every Subject To Be Presented Is on Essentials of Present Problems and Should Arouse Valuable Discussion —Program Is Highly Concentrated and of Wide Scope

EACH of the papers to be presented to the Society of Automotive Engineers at Washington next Tuesday has a bearing on the automotive problems of war. The program is the most concentrated and also the most widespread that the society has ever put forward. There is not a poor paper, each is entirely good and each is highly stimulative of discussion. That all the papers can be dealt with in the time set apart for them cannot be believed, but even if some have perforce to be left over it is a foregone conclusion that the discussions on those which are read will be of great value.

In the following the paper by Wing Commander I. W. Seddon is given in full, and the remainder are extracted with the exception of H. L. Horning's on tractors and one on airplanes by Lieut. A. de La Grange of the French army. Lieut. de La Grange will describe the different types of planes and their several duties and Horning is expected to discuss the need for rapid tractor production in relation to the food supply.

Design and Production of Aircraft in Wartime

By Wing Commander I. W. Seddon

Royal Naval (English) Air Service

FROM what I have so far read and heard, I have gathered, perhaps quite wrongly—indeed, I sincerely hope so—that manufacturers here are far more anxious to reproduce standard types of aircraft than to enter the field as designers and builders of original types of aircraft.

However that may be at the moment, I am perfectly certain that very shortly after a firm has learned to turn out a good standard article, that it will be attacked by the most exhilarating of all microbes, to wit, the microbe which makes men design aircraft that shall go one better than anyone else's.

For the moment then I want to deal with the design of military aircraft in wartime.

We may well start out with one of the proved facts of aerial warfare: "The command of the air rests very largely indeed with that side that produces the best single-seater fighter." Provided, of course, that it is produced and used in sufficient quantity.

Many New Designs Produced

This state of affairs is so clearly recognized in France and Great Britain that particular attention is devoted to the improvement of this type, with the result that new and improved designs are now being built and tested as fast as possible. This results, of course, in many new designs being produced, of which, however, only a few show outstanding merit and are consequently reproduced in quantity. Of the designs hitherto popular some have survived a year, some six months, and some have only had a life of usefulness on the Western front of 3 months.

The designs that have lasted a year have always finally overstayed their welcome, and I think that probably we shall find a "vogue-period" for the single-seater fighter type to be never more than 6 months in the future.

The real reason of this is, of course, that it takes the enemy not more than 6 months in which to get to know all about any particular type and copy or improve it, if he has not already something better of his own. Then something better has to be forthcoming or command of the air will have to be conceded.

The same line of progress certainly applies to other types of airplanes than the single-seater fighter, as also to various types of seaplanes, but to a far less extent; it is unnecessary to labor the point.

Must Design in Advance

It is clear then that the designer, particularly the designer of the small fighting airplane, whether he be in France, Great Britain or America, is always confronted with the problem of designing a type that is an advance on any contemporary machine of a similar type. A machine can be an advance on a similar type in one of two main respects:

(a) Because it possesses a better performance.

(b) Because its fighting facilities are better.

Each of these main headings includes a number of subdivisions; thus better performance may mean better climbing only or better speed only or greater endurance or any combination of these, while better fighting facilities may mean better maneuvering capacity or better view or better positions for guns or improved weapons or any combination of these.

The designer then who sets out to design a new type must proceed along one or more of the following general lines:

(a) Increase the horsepower-weight ratio.

(b) Decrease the wing or structure resistances.

(c) Devise a new arrangement of the supporting planes, with regard to the position of pilot or crew.

Improvement in the horsepower-weight ratio is most readily achieved by the utilization of greater horsepower or engines lighter per horsepower than those employed in the type he is designing. It is said most readily achieved, and this is because progress in aviation engines is still fairly rapid. But a good deal can be done by close and accurate design, which implies the removal of all redundant weight.

Factors in Detail Improvement

Improvement in wing resistance is a matter for the wind-tunnel experimentalist and not for the designer, but the converse has actually been true in a great measure in the past.

Improvement in structure resistance requires the designer and the wind-tunnel experimentalist to work closely together, but it involves in any case the reduction of exposure of engine parts, external fittings and controls, besides the accurate shaping of the body and the simplification of the chassis, which are matters entirely for the designer.

Variation in arrangement of supporting surfaces. It is possible to vary the arrangement of the planes in an infinite number of ways, but the prime object in view is practically always to improve the view of the pilot, and roughly therefore the favored types are the parasol monoplane, the biplane with planes of unequal chord and the heavily staggered triplane. It is probably true that the practically unstaggered equal-planed biplane with a gap equal to the chord and an aspect ratio, in accordance with the gross weight, running from about five in very small machines to perhaps ten in the very large ones, gives about the most efficient aeronautical arrangement for an airplane.

Any deviation from such an arrangement may and usually does involve greater efficiency of the supporting surfaces, but at a cost of greater weight. It is possible to make these two factors balance and perhaps even show an over-all aeronautical advantage for the unusual arrangement, but a designer has to be most intimately acquainted with every branch of aeronautics before he can attempt such arrangements with

any real chance of making good against the simpler structure.

I now want to return to the subject of the reduction of wing and structure resistances, because it is in these two respects quite as much as in the matter of engine design that notable progress has recently been made by designers in France and Great Britain.

There are two ways (of these the first is by far the most important) in which wing resistance has been notably reduced, namely:

(a) By the employment of low resistance aerofoils.

(b) By properly shaping the wing tips.

To grasp thoroughly the aerofoil resistance problem it is necessary to preface that wind-tunnel research (following indeed in the wake of practical experiment) has now given us a very good range of aerofoils varying from the low resistance aerofoil, which carries about 5 lb. per sq. ft. at 45 m.p.h. at its maximum lift angle, through the medium-lift aerofoil carrying round about 6 lb. per square foot under the same conditions, to the high lift aerofoil which carries 7½ lb. per square foot under the same conditions.

High-Lift Aerofoils Save Weight

It is obvious that when the minimum speed is specified, if the aerofoil carrying 7½ lb. per square foot is utilized in place of that carrying only 5 lb. per square foot (both at 45 m.p.h., the speed usually named) that there will be a very large saving in area and consequently in weight by using the high-lift variety. Moreover it must be borne in mind that the weight saved is not by any means confined to the saving of supporting surface, because firstly the stresses are reduced, then the tail area or length of body may be reduced. In fact, as a rough approximation it may be assumed that the saving is at the rate of 1½ lb. per square foot of area saved. This at once very materially increases the horsepower-weight ratio in favor of the high-lift winged machine.

Moreover, with the reduction in area and weight there comes improved view and ease of handling—except that in dives the high-lift wing type will have a comparatively low limiting speed.

Notwithstanding these factors, however, the resistance of the high-lift type of aerofoil is so much greater than that of the low resistance type at fine angles that as soon as the horsepower for weight is increased beyond perhaps 1 hp. to 17 or 18 lb. we find that the speed range of the low resistance type increases far beyond that of the high-lift type.

To illustrate this point, it is quite possible that the superscout of the near future with a low resistance type areofoil will have a speed range of 50 to 150 m.p.h. The same machine fitted with a medium lift type curve such as R. A. F. 6 would probably achieve 50 to 125 m.p.h. and with the highest lift aerofoil 50 to 100 m.p.h. only.

The horsepower curves for various aerofoils ranging from the lowest resistance type so far experimented with, through the medium lift to the medium-high lift type are given in the drawing and illustrate clearly the point that while excess horsepower is of value in the low resistance aerofoil it becomes increasingly wasteful as the lift of the aerofoil is increased.

It also illustrates how little difference there is in the climbing rates of any aerofoil despite the weight handicap carried by the low lift type.

To conclude, I urge that inasmuch as two heads are better than one, so three are better than two; consequently it is most desirable that the designers in this country be encouraged to compete in the race of producing the best fighting scout.

The field is perfectly open and the judging is above suspicion because the ultimate judgment is recognized to be in the hands of the pilots, who demand the best.

New Engine Predicted

That tractors will soon be using engines of a totally different type is the prediction of C. E. Sargent, chief engineer Lyons-Atlas Co., in his paper. He states that the small size Diesel system engine which can be started by hand without pre-compressed air is almost perfected. Such an engine by burning its fuel in an excess of air can attain a much higher fuel efficiency than the conventional four stroke and will burn a wide range of fuels.

Mr. Sargent points out that a great fuel saving would result if the four stroke engine were redesigned so that the expansion, or power stroke, was longer than the compression stroke, an effect that can be obtained from suitable valve setting and design. Instead of exhausting at 30 lb. to 40 lb. per square inch the long expansion engine could have a terminal pressure much nearer atmospheric. It is suggested that the increase of weight would be about 20 per cent in order to obtain an increase of fuel efficiency of over 20 per cent.

It is hoped that some more details of the engine with which Mr. Sargent has been experimenting will be forthcoming at the meeting.

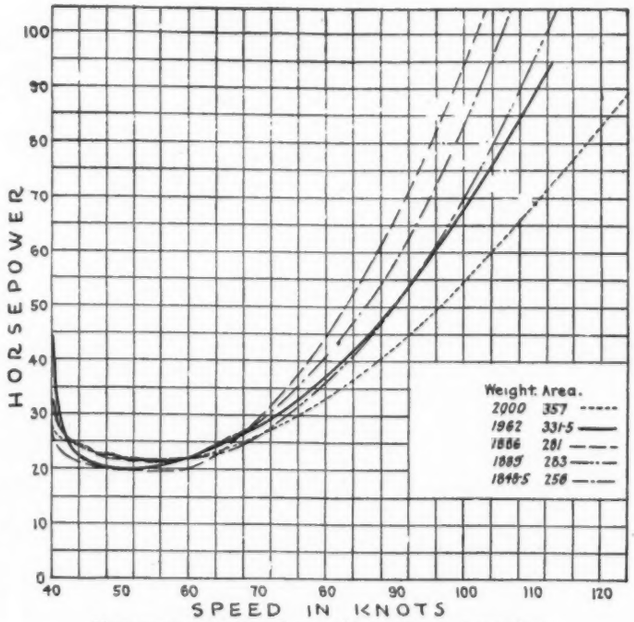
European Lessons of Truck Design

The paper by Owen Thomas deals with his experiences when working near the front on mechanical transport. It is a long and very detailed analysis of all truck troubles, not neglecting the very smallest. It teems with suggestions for future military vehicles and is a contribution to the meager literature of the subject of no mean value.

In addition to dissecting detail, such matters as the proper and improper methods for fitting a valve spring retainer, the correct dimensions for bearings, etc., some much broader aspects of truck engineering are considered. Thomas expresses his profound belief in the virtue of a three unit system of construction; the engine, the rear axle and a middle unit combining both the clutch and the gearset. He points out that the unit system of engine and transmission provokes trouble when the engine bearings are taken up and makes the clutch very hard to get at for adjustment of relining. With a midships gearset and the clutch on the engine we still have a good deal of weight hung on the power plant, so it is difficult to use oil on the clutch and to inclose it completely without complication. The maximum of advantage and minimum of disadvantage, Thomas claims, are found in the combined clutch and transmission mounted amidships.

On truck tires Thomas disagrees with the finding of the U. S. War Department in favor of demountables. In France, he says, the demountable types gave much trouble through rusting on, despite generous galvanizing of the parts before assembly, while the pressed-on tires would always come off. In a word it was found easier to arrange for an adequate supply and distribution of wheel presses than to overcome the rusting trouble encountered with demountables. Rail cars carrying the tire supplies from the base are often equipped with tire presses and used as replacement stations.

Trucks with no differential whatever have been giving better service than those with conventional equipment is an-



Horsepower curves for various types of aerofoils

other interesting comment and the author states most emphatically that the ordinary differential should not be considered for military work.

Gear Ratios and Engine Governors

Another subject concerns gear ratios and engine governors. In this connection it is remarked that a truck must have an ability to do 12 m.p.h. on intermediate so as to be able to keep a good speed on grades. If the climbing speed is too low the column strings out too much as each machine gets over the hill and starts to descend. Most of the trucks used in France, it is stated, can do 20 m.p.h. on high gear, though it is not intended that this speed should be used except in emergency where rapid movement means greater safety. A detail of some importance in the aggregate is the gear lever positions. Having four speeds with a very low bottom gear starting is usually performed on second, and only second, third and high used for running. The low gear and reverse are usually both required for close maneuvering. This being the case it is an advantage to so arrange the reverse that the shift from reverse to low is easy, as it is when the two positions are in the same slot of the "gate" or its equivalent.

Brakes are condemned in a wholesale way. Especially have they failed from lack of protection, which allows mud to clog them till they are useless.

One of the least expected comments is that storage batteries have given little trouble, and that electric starters when used most frequently fail owing to some derangement of the starter pinion or clutch. A detail of lighting which would usually escape notice is the desirability of having a tail lamp on both sides, the purpose being to indicate the position of a convoy when drawn up at the roadside on either right or left as convenience demands. Altogether the paper is one which should provoke a great amount of discussion.

Standardizing Boat Production

Henry R. Sutphen, vice-president Elco Co. and Submarine Boat Co., describes in his paper how a quantity of submarine chasers were built for the British Government, which ordered 550 identical boats. This meant the building of engines of 220 hp. of wood hulls and equipment with every accessory. It called for organization on a hitherto unheard of scale in boat building and difficulties were encountered all along the line in getting material. Mr. Sutphen's experiences show how far outside the ordinary procedure it is necessary to go when an output is suddenly boosted several hundred per cent.

Program of S. A. E. Summer Meeting in Washington

MONDAY, JUNE 25

9 to 9.45 a. m.—Registration at Temporary S. A. E. Headquarters, Hotel New Willard.

9.45 a. m.—Buses leave Hotel New Willard for Bureau of Standards.

10 a. m.—Meeting of Standards Committee, Bureau of Standards (*Auditorium, East Building*).

The following Divisions are expected to report:

Aeronautic	Iron and Steel
Ball and Roller Bearings	Transmission
Data Sheet	Lighting
Electrical Equipment	Miscellaneous
Engine	Starting Battery

1 to 2 p. m.—Luncheon at Bureau of Standards.

2 p. m.—Adjourned session of Standards Committee Meeting, if necessary, to be followed by *tour of inspection* of Bureau of Standards.

2 p. m.—Council Meeting, Bureau of Standards.

8 p. m.—Meeting of Section Committee, including the Chairmen of all the Sections of the Society at Office of Society, Munsey Building, Pennsylvania Avenue near Fourteenth Street.

TUESDAY, JUNE 26

9 to 9.45 a. m.—Registration at S. A. E. Headquarters, Hotel New Willard.

9.45 a. m.—Buses leave Hotel New Willard for Bureau of Standards.

10 a. m.—Business and Professional Session at Bureau of Standards (*Auditorium, East Building*).

President's Address	Election of Members of Nominating Committee
Report of Treasurer	New Business
Report of Membership Committee	Report of Standards Committee
Discussion of Constitutional Amendments	

Discussion of reports approved at meeting of Standards Committee held in Cleveland on May 3:

Aeronautic	Starting Battery
Chain	Lighting
Electrical Equipment	Tire and Rim
Marine	Ball and Roller Bearings
Research	Data Sheet.

Discussion of reports approved at meeting of Standards Committee on June 25. (See list above of divisions which are expected to submit reports.)

1 p. m.—Luncheon at Bureau of Standards.

2 p. m.—Professional Session.

PAPERS

Building Submarine Chasers by Standardized Methods, by Henry R. Sutphen (*to be illustrated by motion pictures*).

The Farm Tractor as Related to the Food Problem, by H. L. Horning (*to be illustrated by motion pictures*).

Design and Production of Aircraft in War Time, by Wing Commander I. W. Seddon, of the British Commission.

Classes and Uses of Battleplanes, by Lieut. Amaury de la Grange, of the French Commission.

Fundamentals of a Successful Kerosene-Burning Tractor Engine, by C. E. Sargent.

Lessons of the War in Truck Design, by W. O. Thomas.

7 p. m.—Informal Dinner, Hotel New Willard.

GENERAL INFORMATION

REGISTRATION—Members and guests are requested to register and secure identification badges at temporary Society Headquarters, Hotel New Willard, as soon as possible after arrival in Washington.

TRANSPORTATION—Cars or buses will be provided to transport members and guests from the Hotel New Willard to the Bureau of Standards and return on both June 25 and 26. They will leave the hotel at 9.45 a. m. and return after the afternoon sessions.

SURFACE CARS—The Bureau of Standards may be reached readily by surface car as follows:

Take a car marked "Rock Creek Bridge" at Union Station and ride (about 25 min.) to the "Loop," Twentieth and Calvert Streets (ask for transfer upon payment of fare).

From the "Loop" take car marked "Chevy Chase Lake," ride (about 10 min.) to Pierce Mill Road and Connecticut Avenue.

The Bureau of Standards is located on a hill at the left.

The "Chevy Chase Lake" car can also be taken from downtown in the neighborhood of the hotels, either at Fifteenth Street and New York Avenue (every 12 min.—30 min. ride), or at Seventh Street and Pennsylvania Avenue (every 15 min.—35 min. ride). These cars go to the Bureau of Standards without change.

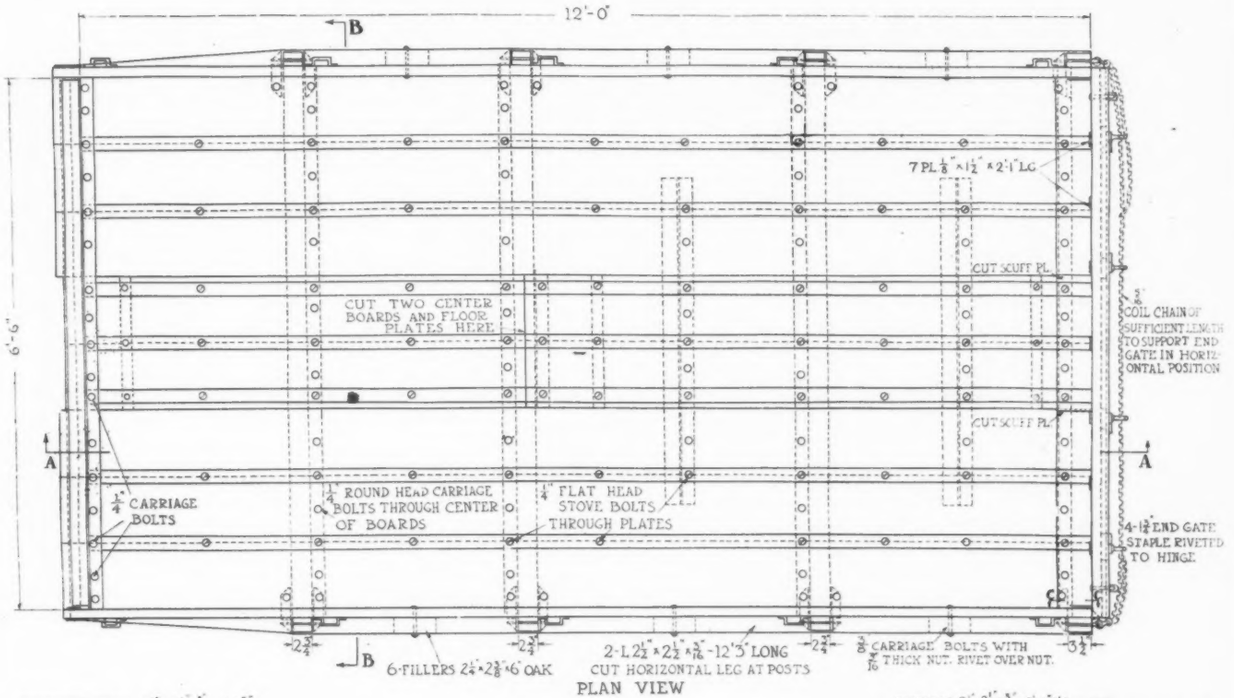
RAILROAD RESERVATIONS may be obtained at S. A. E. Headquarters, Hotel New Willard, on Tuesday morning, June 26. A special representative of the Pennsylvania Railroad will be there on hand for this purpose.

DRESS AT DINNER will be strictly informal. This is in the nature of a business affair and business clothes are quite in order. Ladies will not attend the dinner. Men in the service are not permitted to drink intoxicating beverages, hence drinks of this kind will not be served.

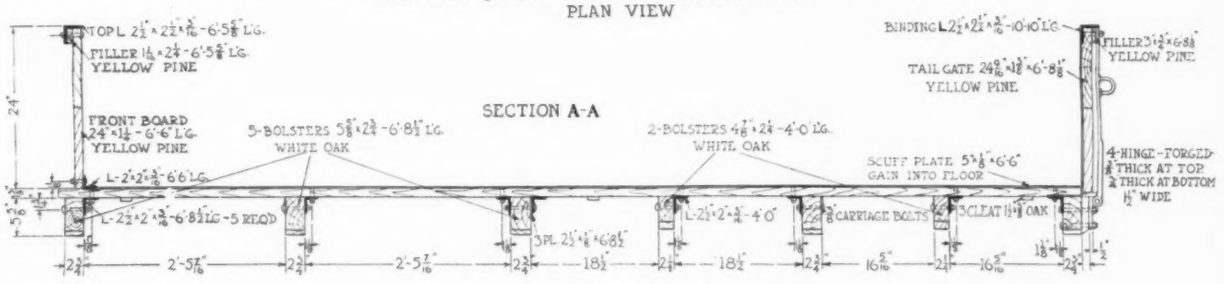
Dinner Tickets may be purchased at temporary S. A. E. Headquarters at Hotel New Willard, until 6 p. m., June 26, but seating lists go to press at 6 p. m., June 23.

WAR DEPARTMENT DRAWINGS FOR TRANSPORT BODY CLASS B MILITARY TRUCK

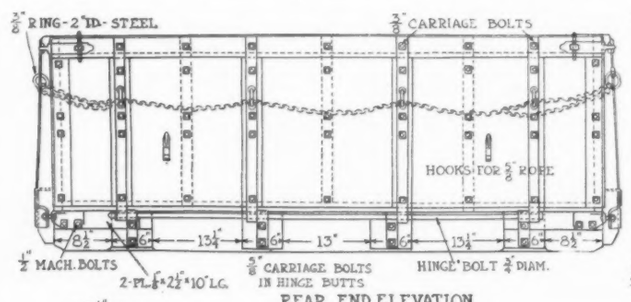
Specifications Published in THE AUTOMOBILE for April 19


12'-0"
B
7 PL. 1/8" x 1 1/2" x 2'-1" LG.
CUT SCUFF PL.
CUT TWO CENTER BOARDS AND FLOOR PLATES HERE
6'-6"
A
A
1/4" CARRIAGE BOLTS
1/4" ROUND HEAD CARRIAGE BOLTS THROUGH CENTER OF BOARDS
1/4" FLAT HEAD STOVE BOLTS THROUGH PLATES
3/8" COIL CHAIN OF SUFFICIENT LENGTH TO SUPPORT END GATE IN HORIZONTAL POSITION
4-1 1/2" END GATE STAPLE RIVETED TO HINGE
B
6-FILLERS 2 1/4" x 2 1/8" x 6' OAK
2-L 2 1/2" x 2 1/2" x 3/16" - 12'-3" LONG CUT HORIZONTAL LEG AT POSTS
3/8" CARRIAGE BOLTS WITH 1/16" THICK NUT. RIVET OVER NUT.

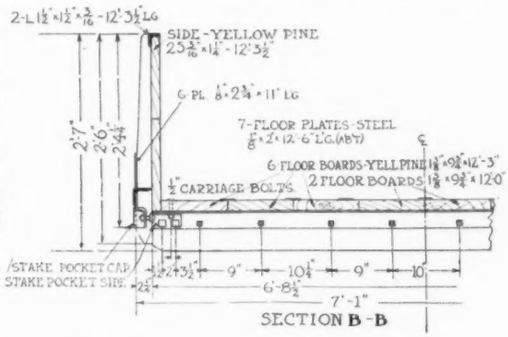
PLAN VIEW


TOP L 2 1/2" x 2 1/2" x 5/16" - 6'-5 5/8" LG.
FILLER 1 1/16" x 2 1/8" - 6'-5 5/8" LG. YELLOW PINE
BINDING L 2 1/2" x 2 1/2" x 5/16" - 10'-10" LG.
FILLER 3 1/2" x 6 3/8" YELLOW PINE
TAIL GATE 24 9/16" x 12" - 6'-8 1/2" YELLOW PINE.
FRONT BOARD 24" x 1 1/2" - 6'-6" LG. YELLOW PINE
5-BOLSTERS 5 5/8" x 2 3/4" - 6'-8 1/2" LG. WHITE OAK
2-BOLSTERS 4 7/8" x 2 1/4" - 4'-0" LG. WHITE OAK
SCUFF PLATE 5" x 1/8" x 6'-6" GAIN INTO FLOOR
4-HINGE - FORGED 3/8" THICK AT TOP 1/2" THICK AT BOTTOM 1 1/2" WIDE
L-2" x 2" x 3/16" - 6'-6" LG.
L-2 1/2" x 2" x 5/16" - 6'-8 1/2" LG. - 5 REQ'D
3 PL. 2 1/2" x 1/8" x 6'-8 1/2"
L-2 1/2" x 2" x 3/16" - 4'-0"
3/8" CARRIAGE BOLTS
3 CLEAT 1 1/8" x 1 1/8" OAK
24"
2'-5 7/16"
2'-5 7/16"
18 1/2"
18 1/2"
16 5/16"
16 3/16"

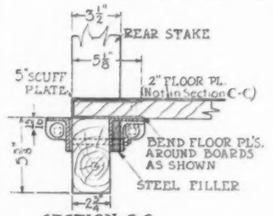
SECTION A-A



REAR END ELEVATION


2-L 1 1/2" x 1 1/2" x 3/16" - 12'-3 1/2" LG
SIDE - YELLOW PINE 2 5/16" x 11 1/4" - 12'-3 1/2"
6 PL. 1/8" x 2 3/4" x 11" LG
7-FLOOR PLATES - STEEL 1/8" x 2" x 12'-6" LG. (ABT)
6 FLOOR BOARDS - YELL. PINE 1 1/8" x 9 1/2" x 12'-3"
2 FLOOR BOARDS 1 1/8" x 9 1/2" x 12'-0"
1/2" CARRIAGE BOLTS
2'-7"
2'-6"
2'-4"
STAKE POCKET CAP
STAKE POCKET SIDE
2 1/2"
3 1/2"
9"
10 1/4"
9"
10"
6'-8 1/2"
7'-1"

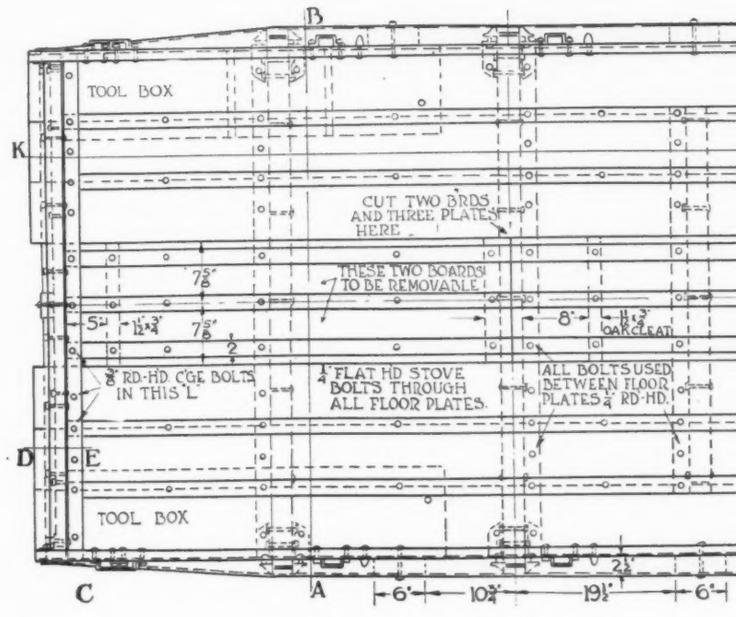
SECTION B-B

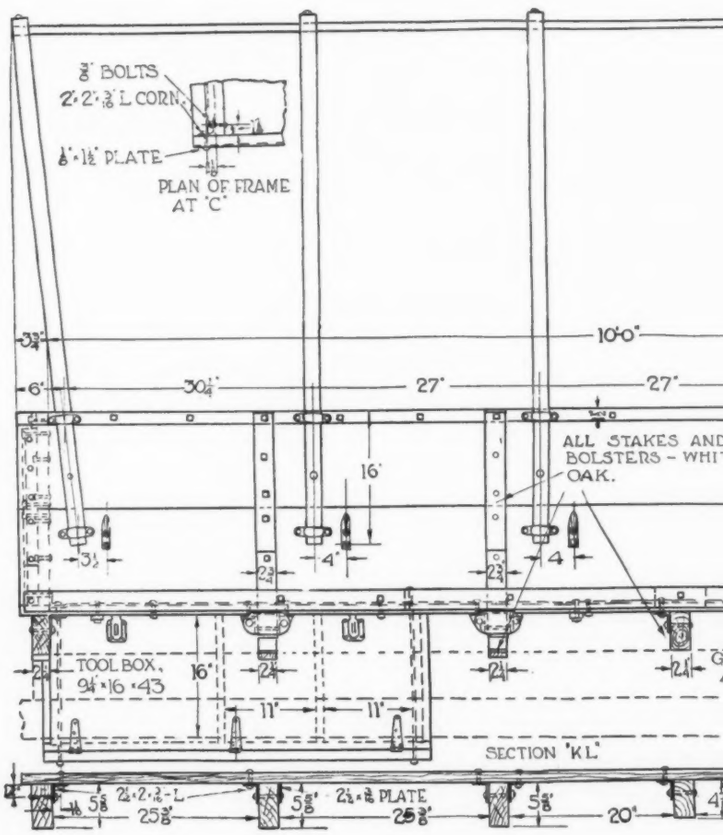


SECTION C-C

The sides, head and tail board and floor to be of best quality yellow pine, poplar, cottonwood or gum. The side stakes, bolsters, sills, top bows and ridge pole may be made of best quality white oak, ash, rock elm or hickory

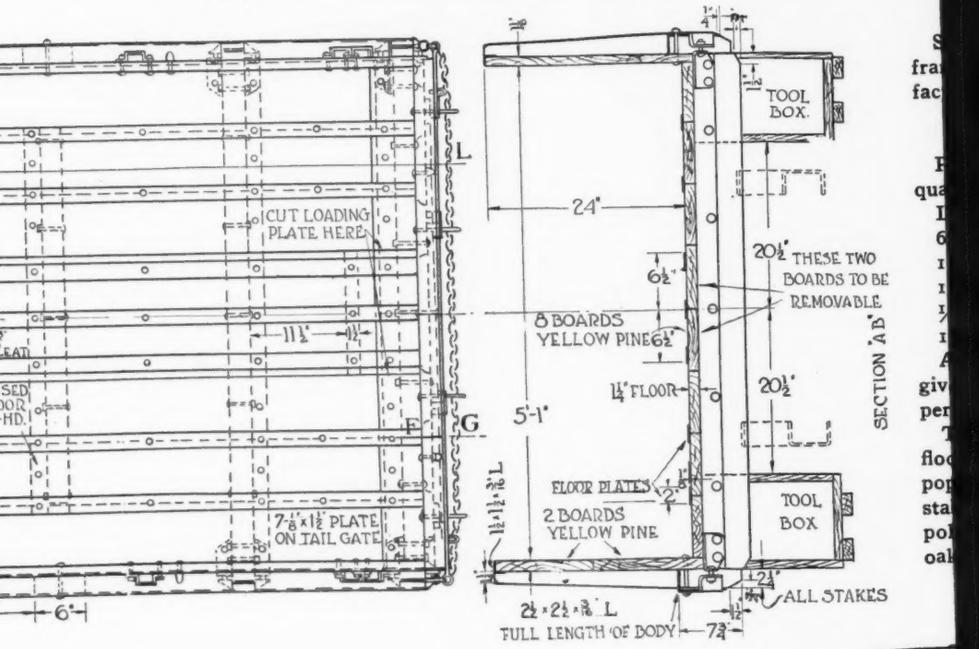
WAR DEP

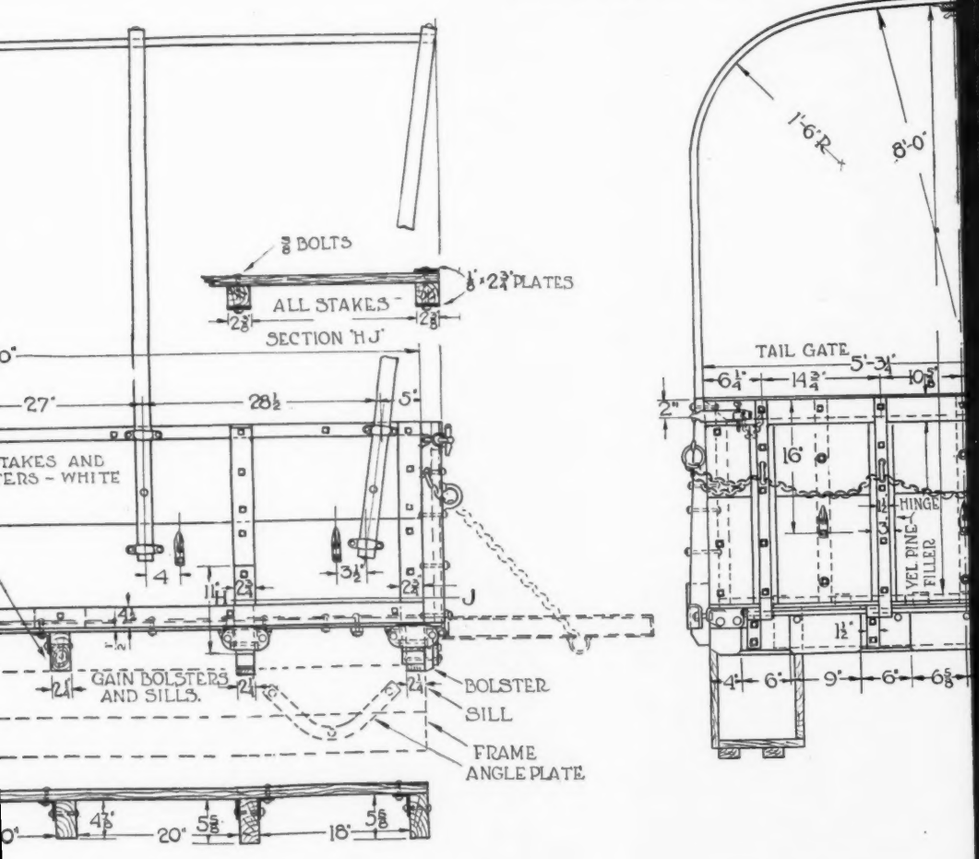

B
TOOL BOX
K
CUT TWO BRDS AND THREE PLATES HERE
THESE TWO BOARDS TO BE REMOVABLE
7⅝"
5½"
1½"×¾"
7⅝"
8"
1½"×¾" OAK CLEAT
⅝" RD-HD C'GE BOLTS IN THIS 'L'
¼" FLAT HD STOVE BOLTS THROUGH ALL FLOOR PLATES.
ALL BOLTS USED BETWEEN FLOOR PLATES ¼" RD-HD.
D
E
TOOL BOX
C
A
6"
10¾"
19½"
6"
2½"


⅝" BOLTS
2"×2"×⅛" L CORN.
⅛"×1½" PLATE
PLAN OF FRAME AT 'C'
3¼"
10'0"
6"
30¼"
27"
27"
ALL STAKES AND BOLSTERS - WHITE OAK.
16"
3½"
4"
4"
TOOL BOX, 9¼"×16"×43"
16"
11"
11"
SECTION 'KL'
2½"×2"×¼"-L
5⅝"
25⅝"
2½"×⅛" PLATE
5⅝"
25⅝"
5⅝"
20"

DEPARTMENT DRAWINGS FOR TRANSI
CLASS A MILITARY TRUCK

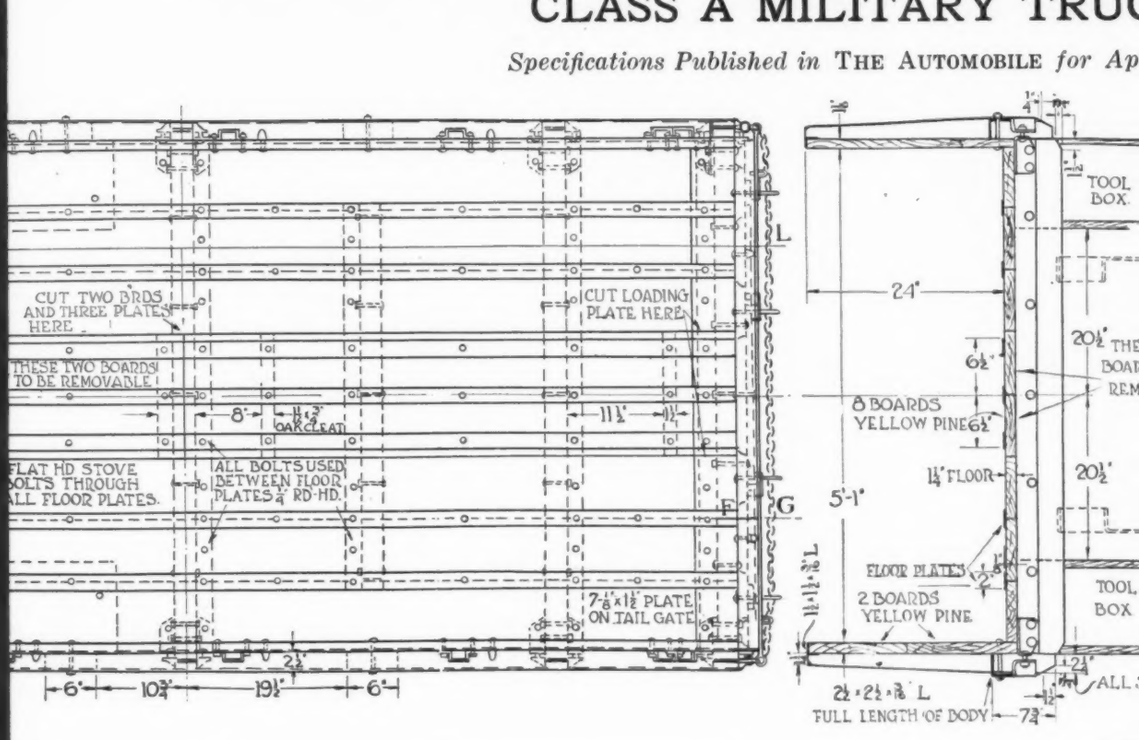
Specifications Published in THE AUTOMOBILE *for April* 19

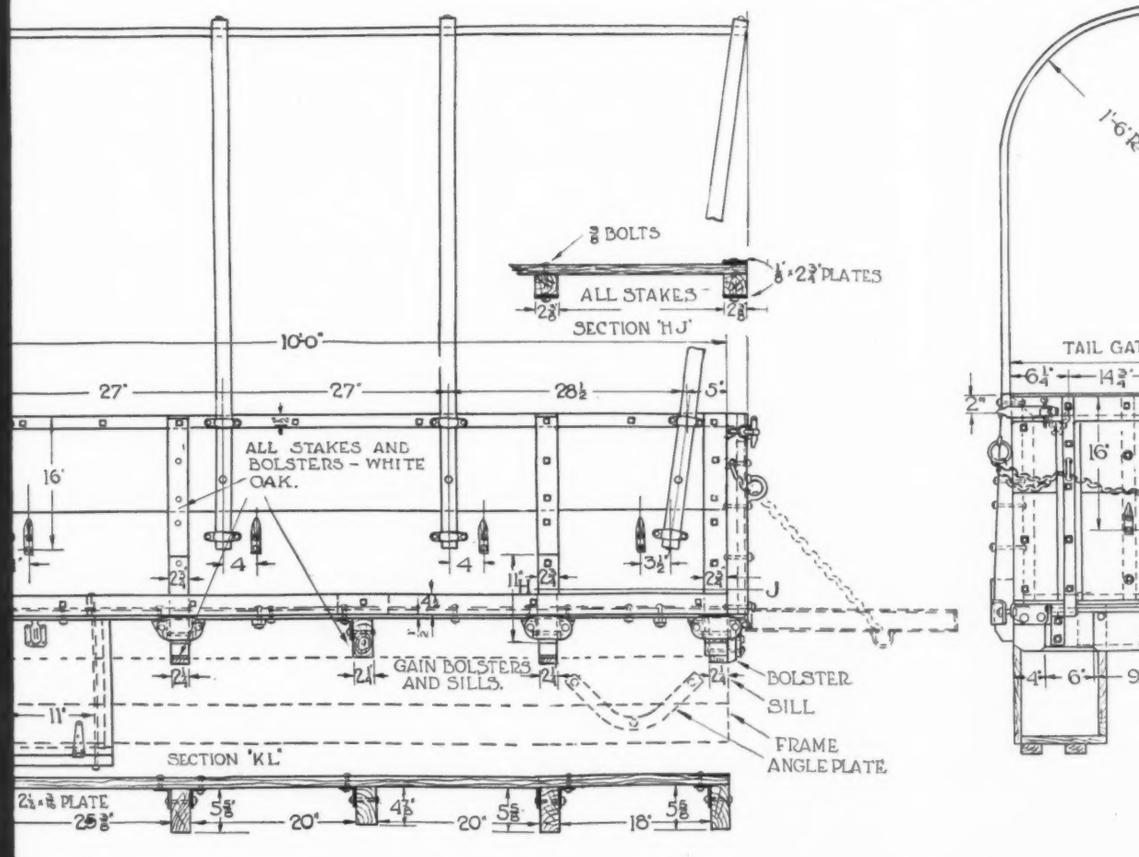




WAR DEPARTMENT DRAWINGS FOR TR
CLASS A MILITARY TRUC

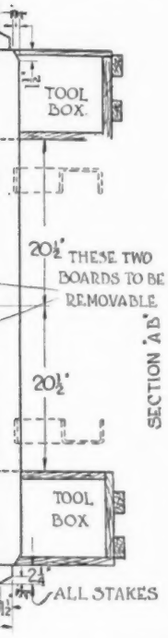
Specifications Published in THE AUTOMOBILE *for Ap*





R TRANSPORT BODY
TRUCK

for April 19



Sills and bolts for holding body to frame to be furnished by truck manufacturer.

Specifications for Paint

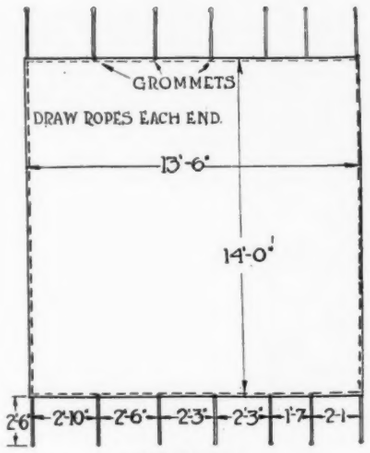
Paint body with three coats, best quality.

Lead and oil of following composition:

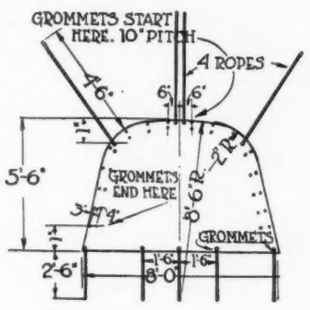
6 lb. white lead ground in linseed oil.
1 lb. raw umber.
1 pt. turpentine.
½ pt. Japan drier.
1 qt. raw linseed oil.

All finished woodwork and iron to be given a good coat of lead and oil and be permitted to dry before assembling.

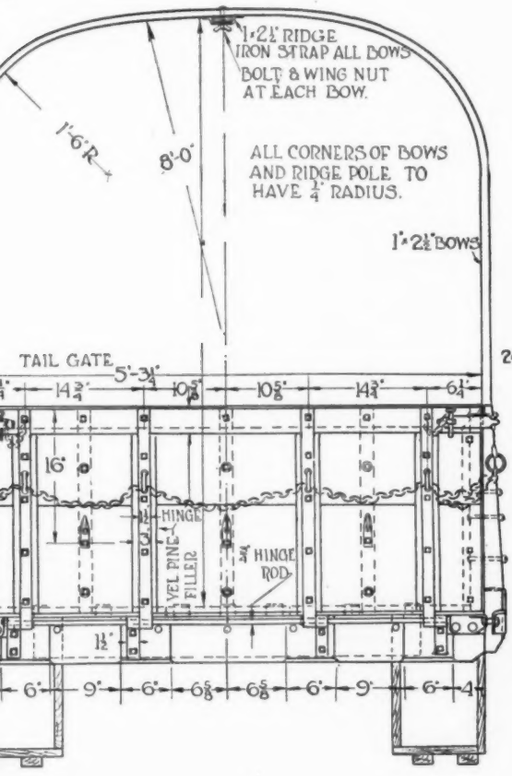
The sides, head and tail board and floor to be of best quality yellow pine, poplar, cottonwood or gum. The side stakes, bolsters, sills, top bows and ridge pole may be made of best quality white oak, ash, rock elm or hickory.

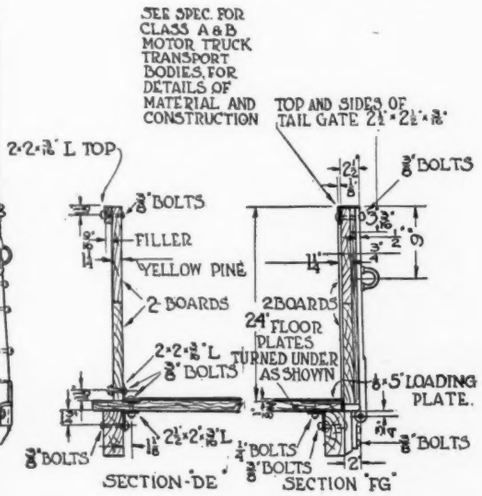


TOP COVER.



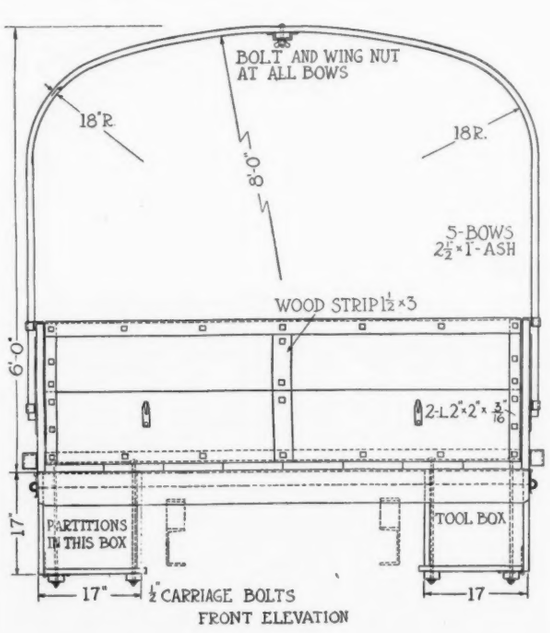
REAR END COVER

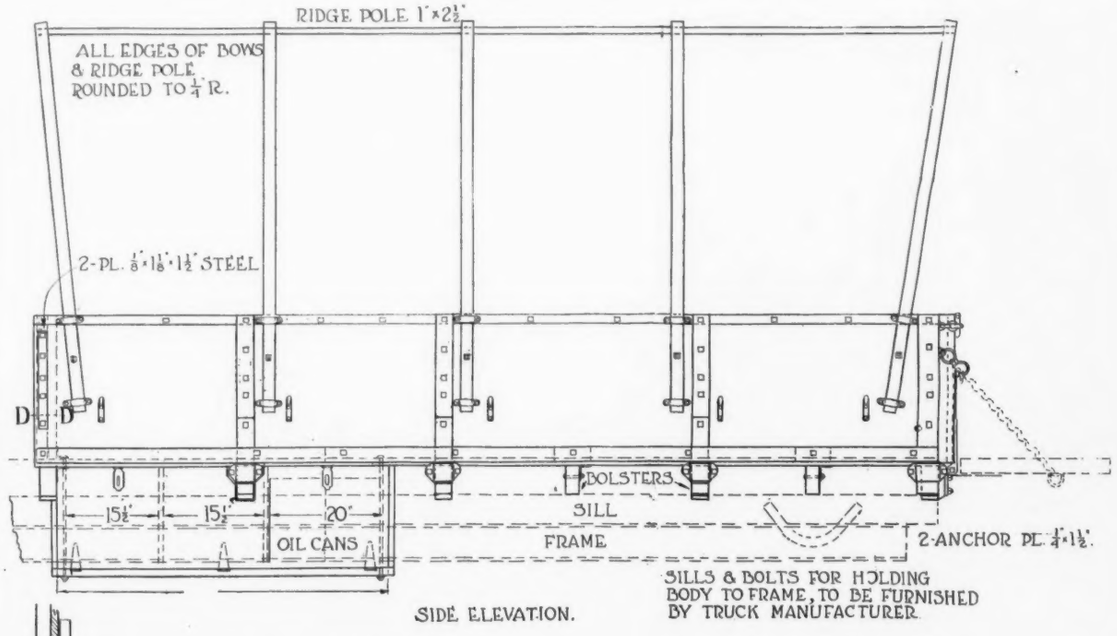


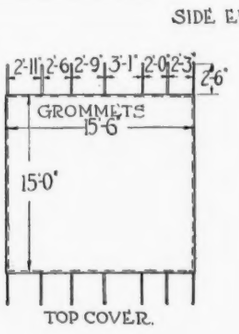


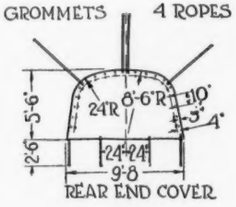
WAR DEPARTMENT DRAWINGS FOR TRANSPORT BODY CLASS B MILITARY TRUCK

Specifications Published in THE AUTOMOBILE for April 19









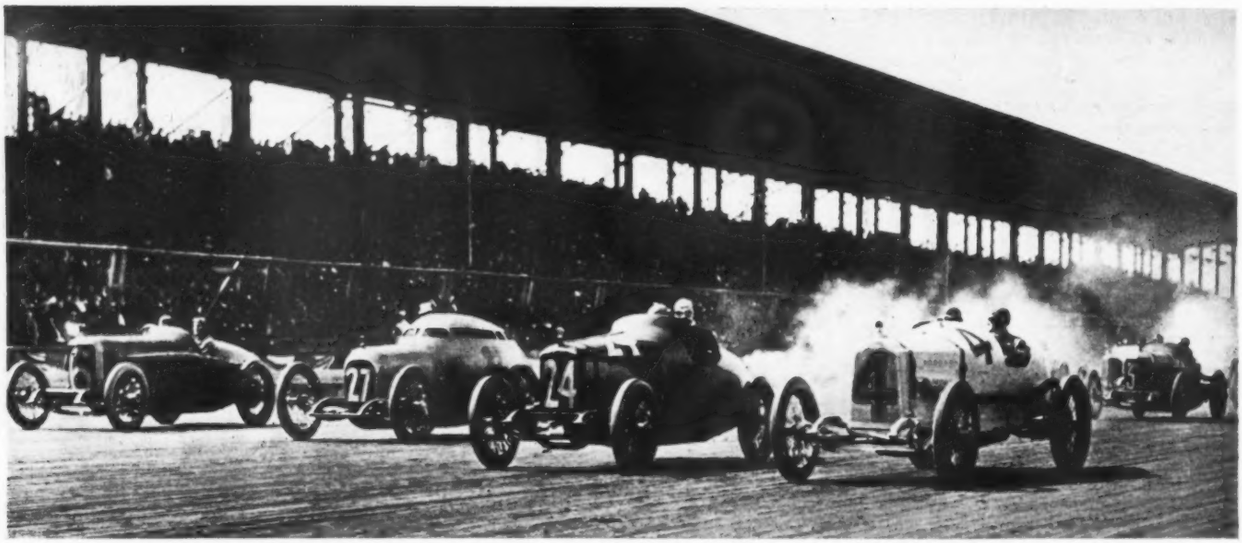
SEE SPEC'S. FOR CLASS **A & B** MOTOR TRANSPORT BODIES FOR MATERIALS AND DETAILS OF CONSTRUCTION

SPECIFICATIONS FOR PAINT

Paint body with three coats best quality lead and oil of following composition:

6 lbs. white lead ground in linseed oil.
1 lb. raw umber.
1 pt. turpentine.
¼ pt. Japan drier.
1 qt. raw linseed oil.

All finished woodwork and iron to be given a good coat of lead and oil and be permitted to dry before assembling.



Cars lined up on the Chicago speedway for the start of the 250-mile Derby. The cars in the front row, left to right, are Thomas' Mercer, Oldfield's Oldfield, Boyer's Frontenac and DePalma's Packard

Cooper Wins Chicago Derby

Captures the 250-Mile Event at 103.15 M.P.H.—Mulford's Hudson Second and Durant's Delage Third—Record Crowd

CHICAGO, June 16—The 250-mile speedway race to-day was won by Earl Cooper driving the Stutz which has figured in so many other events. His average was 103 m.p.h., the total time being 2 hr. 25 min. 28.8 sec. He drove without a single stop from start to finish. Mulford, with a Hudson was second, only 42 sec. behind the winner and third place went to Cliff Durant on a Delage, 25 sec. behind Mulford.

Three cars crossing the tape within just over one minute meant an exciting finish which had been rendered all the more so by the fact that Mulford had been in the lead till within 15 miles of the finish, after which period two short tire stops put him too far back to regain the lead. DePalma, driving the twin-six Packard, had bad luck with ignition, being forced to change a storage battery and finished eleventh after leading at the start. This was a disappointment because the Packard had made fastest time in elimination runs and was without doubt the most speedy machine in the race.

Thrilling Battle for Third Place

Durant and Eddie Hearne driving Duesenbergs had a neck and neck fight for third place, and the battle for third position offered as many thrills as did the one for major honors. As it was, Hearne finished within 25 sec. of Durant according to the official time, so close in fact that the unofficial announcement before the times were re-checked gave third place to Hearne.

The first four to finish crossed the tape within 1½ min.

Mulford's Hudson broke the speedway record for both 150 and 200 miles. His time for the first distance was 1 hr. 26 min. 14.9 sec., and he negotiated the 200-mile stretch in 1 hr. 55 min. and 15 sec. flat.

There was probably the largest crowd which ever witnessed a race at a local speedway, it being numbered from 40,000 to 60,000. The grandstands and bleachers were well filled before the big race started and every available parking space was taken.

The program of the day's events was given a patriotic flavor by making it a benefit performance for war causes, in which patriotic funds got a percentage of the net receipts and also by featuring an exceptionally well arranged sham battle in which 3000 Chicago high school cadets staged "an attack on the trenches," as a demonstration of the manner in which war is waged in Europe. All the paraphernalia of modern warfare was in operation, including preliminary scouting and bomb dropping by eight military airplanes from the United States Aviation School at Ashburn, their bom-

Winners in 250-Mile Race

Car and Driver	Time	M.P.H.	Prize
Stutz, Cooper	2:25:28.8	103.15	$8,000
Hudson, Mulford	2:26:11.03	102.62	4,600
Delage, Durant	2:26:36.43	102.04	2,100
Duesenberg, Hearne	2:27:48.03	101.52	1,500
Mercer, Haines	2:30:56.43	99.39	1,000
Duesenberg, Henderson	2:33:07.95	98.09	900
Hoskins, Lewis	2:35:08.07	97.60	800
Hudson, Vail	2:39:03	94.31	800
Frontenac, Chevrolet	2:40:08.86	93.67	600
Mercedes, Fontaine	2:42:23.9	92.63	600

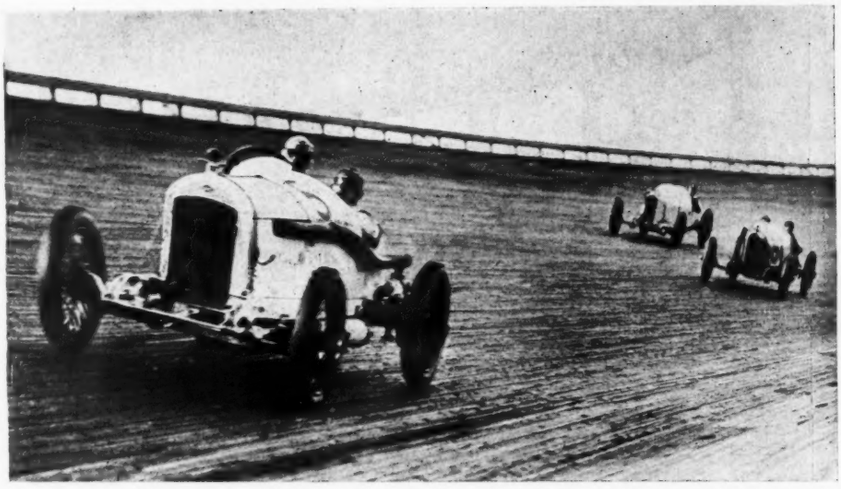
Eliminated

Car and Driver	Lap	Cause
Delage, Devigne	5	Water jacket
Ogren, Henning	12	Broken piston ring
Hudson, Patterson	21	Broken spring
Delage, LeCain	17	Cylinder head
Detroit Sp., Buzane	12	Broken piston
Oldfield, Oldfield	24	Valve spring cap
Mercer, Thomas	18	Left course
Duesenberg, Diedrich	16	Broken connecting rod
Frontenac, Boyer	66	Left course
Ogren, Mason	76	Broken rocker arm

bardment by anti-aircraft guns in the trenches, an armored tank whose armor consisted of cloth and gas bombs.

This was preceded by a demonstration of military transport of troops by motor when the 3000 cadets were transported 13 miles in motor trucks and passenger cars from Grant Park to the Speedway. High school athletic stunts also were staged.

The motor speed program of the day included two events, the first one a non-professional race of 100 miles. This was a free-for-all, and of the ten entries seven cars faced Starter Wagner for the get-away. Of these a Locomobile with Earl Leatherman at the wheel was withdrawn before it had gone 200 yd. The real contenders in this event were two Mercers and a Haynes, the Mercers being driven by Arthur Bromstadt and Andrew Ortmeyer, a licensed Government aviator who had obtained a leave of absence from the military aero station at Ashton for the race. The Haynes was driven by Percy Ford, Jr., connected with the local branch. This event was won by Ford in the twelve-cylinder Haynes at a speed of 89 m.p.h. and second was taken by Ortmeyer in the Mercer at 84 m.p.h. Bromstadt's Mercer came in third. All of these cars are officially specials, as they are entered in the non-stock race.



Cooper, winner of the 250-mile event, sending his Stutz in the home stretch on the last lap of the race

The non-professional event developed into a duel between Ortmeyer and Ford, one or the other leading all the way and interchanging positions frequently up to 70 miles, when Ford took the lead to hold it to the finish. Bromstadt ran a consistent third, with Ed. Schillo's Mercer fourth. Ortmeyer and Ford ran neck and neck until about 75 miles when the Mercer developed plug trouble probably due to oil and lost some time at the pits.

Race Won by Tires

To tell the running story of the 250-mile derby, which is the third running of this classic and is limited to 300-in. cars, is to tell again the oft repeated story of a race won on tires. Cooper's tires stayed with him and he judged his speed so that they lasted throughout the race. Mulford's stops, which lost him the race, were for tire changes.

Dr. Percy Ford, winner of the 100-mile amateur race, receiving the cup from David Reid, president of the Chicago Motor Speedway Assn.

Oldfield, whose new car had been widely heralded and aroused great interest among the spectators, withdrew after running 48 miles. He managed to take the lead in the sixth mile and held it for another lap, then dropped back to second, and the tenth mile when DePalma passed him, in a thrilling neck and neck brush, in front of the grandstand. From then on Oldfield did not figure among the contestants. Oldfield's new car, popularly called the Golden Egg, proved to be a disappointment. This is a construction with which Oldfield expected to increase the safety and at the same time decrease the wind resistance. It has been mentioned before as Oldfield's Submarine. Driver and mechanic are completely inclosed in a sheet aluminum house, shaped to cut down wind resistance, the only openings being rather narrow slits through which the occupant may look. In practice, Oldfield had wire mesh in front of these slits, but removed the mesh before the race because they interfered with his vision. It has an aluminum engine built by Harry Miller, and probably can be developed into a car of continuous speed.

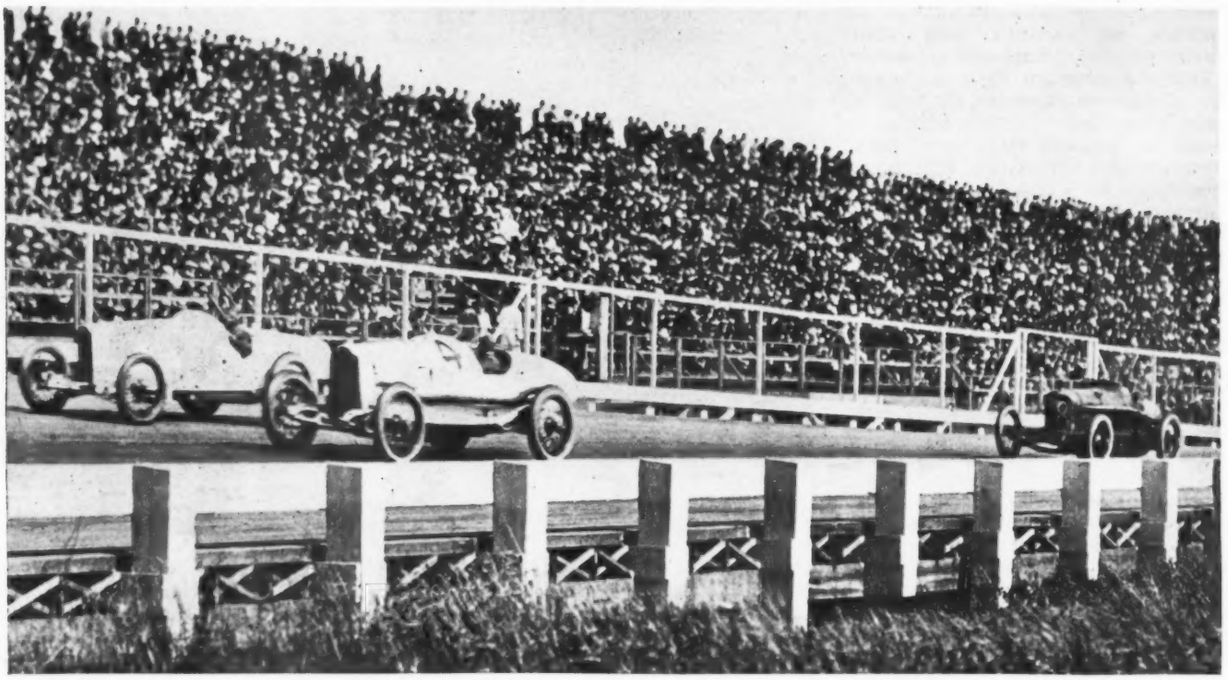
Dirty Plugs Main Trouble

Of the pit stops in the big race, tires and dirty plugs caused the greater number. Obviously there is much in the driving which affects tires, the Chicago speedway being hardest on right rears as a rule. Altogether 34 tires were changed, Alley leading the list with six stops for right rears. In all 59 stops were made, so there were only 25 stops for things other than tires.

Broken parts were not common. Oldfield was put out by a broken valve detail, Buzane's Detroit special and Henning's Ogren were reported to have piston trouble, and LeCain's Delage broke a cylinder. Damage was done to two cars by collision with the backstretch fence, Thomas going through it as the result of a skid, and Patterson breaking a spring and twisting a frame with a glancing blow. Newman came to the pits with a bent front axle after running about half way, but was allowed to proceed. He retired a little later, finding steering too difficult presumably. Louis Chevrolet suffered an oil leak in the Frontenac which caused three stops for replenishment and also flooded the clutch and caused trouble that way.

There was some talk of protest after the race because Chevrolet was permitted to carry a second mechanic around the track to where Boyer was working on his car, making three in Chevrolet's car. Also, some of the contestants who did not finish in the money informally protested against Louis Fontaine being permitted to finish after he had pushed his car across the wire to the pits for repairs. It is not believed that these protests will be formally filed.

A few novelties in the way of detail were noticed on some of the cars and probably one of the most noteworthy was the double system of drag links on Oldfield's special. This consisted essentially of a worm type steering gear, the trans-



A brush on the back stretch during the 250-mile race, giving an idea of the great crowd in the bleachers. DePalma's Packard appears in the foreground and Henderson's Duesenberg at the right

Times of All Finishing Cars in the Chicago Derby, Every Ten Laps—250-Mile Event, June 16

Car	Driver	10	20	30	40	50	60	70	80	90	100	110	120	125
Stutz	Cooper	11:37.1	22:37.8	34:49.5	46:37.5	58:20.6	1:09:58.3	1:21:44.1	1:33:21.7	1:44:58.7	1:56:40.9	2:08:08.1	2:19:42.9	2:25:28.8
Hudson	Mulford	11:29.5	22:53.4	34:18.6	45:47.1	57:21.6	1:08:58.3	1:20:31.8	1:32:00.2	1:43:34.7	1:55:15.0	2:07:55.4	2:20:28.7	2:26:11.3
Delage	Durant	11:36.9	22:51.9	34:17.3	45:46.7	59:18.1	1:10:54.9	1:22:44.7	1:34:34.2	1:46:06.0	1:57:50.1	2:09:18.4	2:20:50.8	2:26:36.43
Duesenberg	Hearne	11:28.2	22:54.1	35:50.7	47:40.4	59:20.4	1:12:17.8	1:24:03.6	1:35:45.5	1:47:16.2	1:58:56.2	2:10:30.9	2:21:58.1	2:27:48.03
Mercer	Haines	11:28.7	24:12.7	35:49.1	47:39.6	59:17.8	1:13:09.8	1:24:47.1	1:36:22.7	1:48:01.3	1:59:35.0	2:11:16.4	2:23:53.3	2:30:56.43
Duesenberg	Henderson	17:49.2	29:40.8	41:24.8	53:14.3	1:05:01.0	1:16:52.9	1:28:46.5	1:40:26.7	1:52:01.2	2:03:37.5	2:15:12.2	2:27:07.4	2:33:07.95
Hudson	Vail	11:26.2	22:52.2	34:17.8	45:39.0	1:03:25.9	1:15:03.8	1:27:24.8	1:38:57.3	1:50:17.9	2:01:39.9	2:12:53.5	2:29:57.4	2:39:03.0
Frontenac	Chevrolet	11:28.3	22:59.0	37:55.3	49:56.2	1:01:50.2	1:14:05.9	1:31:35.3	1:43:29.9	1:55:52.2	2:07:24.5	2:22:51.7	2:34:22.5	2:40:08.86
Mercedes	Fontaine	11:45.9	23:28.5	35:14.6	47:00.2	58:58.9	1:24:37.6	1:36:35.9	1:48:18.8	2:00:07.2	2:11:53.5	2:23:48.9	2:35:44.5	2:42:23.9
Hoskins	Lewis	11:31.3	23:01.4	34:45.2	46:30.8	58:09.2	1:13:01.2	1:24:31.0	1:35:53.3	1:50:19.1	2:01:38.4	2:16:31.2	2:28:37.3	2:35:08.07
Packard	DePalma	11:27.7	23:02.4	34:39.2	46:28.8	58:07.4	1:09:43.7	1:21:25.7	1:33:17.5	2:01:55.9	2:13:34.15	2:25:25.7	2:37:15.5	2:43:08.76

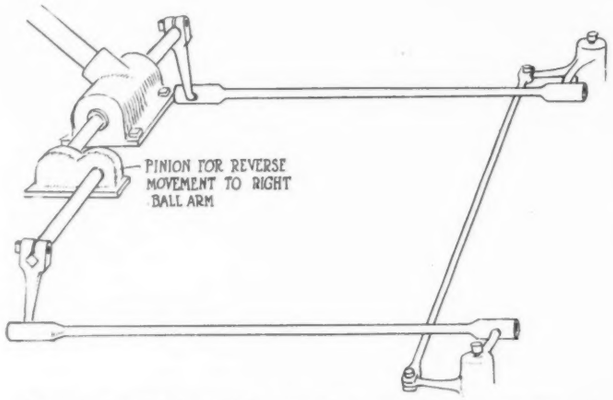
Details of Equipment on Cars in 250-Mile Chicago Derby

Car	Driver	Cyl.	Bore	Stroke	Disp.	Plugs	Carb.	Ignition	Tires	Size	Wheel-base	Oil
Frontenac	Chevrolet	4	3:87	6:37	298	K.L.G.	Miller	Bosch	Goodyear	32x4½	104	Oilzum
Mercedes	Fontaine	4	3.829	6½	299.39	A.C.	Mercedes	Bosch	Goodyear	33x4½—33x5	112	Monogram
Delage Special	Buzane	4	3.826	6½	283	Grossman	Miller	Bosch	Goodyear	33x4½—33x5	112	Monogram
Packard	DePalma	12	2 11/16	4½	299	A.C.	Zenith	Delco	Goodyear	....	112	Monogram
Stutz	Cooper	4	3.828	6.50	295	Rajah	Miller	Bosch	Goodyear	32x4½	102	Aristo
Mercer	Thomas	4	3.872	6.375	300.7	Rajah	Miller	Bosch	Goodyear	32x4½—33x5	108	Oilzum
Duesenberg	Milton	4	3.75	6.75	299	A.C.-Rajah	Miller	Bosch	Goodyear	32x4½—34x4½	106½	Oilzum
Duesenberg	Henderson	4	3.75	6.75	299	A.C.-Rajah	Miller	Bosch	Goodyear	32x4½—34x4½	106½	Oilzum
Hudson	Mulford	6	3.502	5.00	288.6	A.C.	Hudson	Delco	Goodyear	33x5	107½	Oilzum
Duesenberg	Hearne	4	3.75	6.75	298.2	Rajah	Miller	Bosch	Goodyear	32x4½—35x5	106½	Oilzum
Hoskins	Lewis	4	3.75	6.75	298	Rajah	Miller	Bosch	Goodyear	37x4½—33x5	105	Oilzum
Hudson	Vail	6	3.522	5.00	290	A.C.	Hudson	Delco	Goodyear	32x4½—33x5	105½	Oilzum
Delage	Devigne	4	3.78	6.00	280	A.C.	....	....	....	32x4½—33x5	106	Castor
Newman	Taylor	4	3.812	6.50	295	Rajah	Miller	Bosch	Goodyear	32x4½—33x5	102	Oilzum
Hudson	Patterson	6	3.502	5.00	288.6	A.C.	Hudson	Delco	Goodyear	....	105½	Oilzum
Mercer	Haines	4	3.872	6.375	300.7	Rajah	Miller	Bosch	Goodyear	32x4½—33x5	108	Oilzum
Ogren	Henning	4	3.656	7.00	292	Rajah	Miller	Bosch	Goodyear	32x4½	106	Oilzum
Pan-American	Alley	4	3 5/8	7	289	Bosch	Miller	Bosch	Goodyear	32x4½—33x5	106	Castor
Frontenac	Boyer	4	3.87	6.37	298	K.L.G.	Miller	Bosch	Goodyear	32x4½	104	Oilzum
Delage	LeCain	4	3.769	6.00	280	A.C.	Miller	Bosch	Goodyear	32x4½—33x5	106	Castor
Oldfield	Oldfield	4	3.625	7	288.1	A.C.	Miller	Miller	Firestone	34x4½—35x5	104	Oilzum
Omar	Toft	4	3.75	6.75	298	Rajah	Miller	Bosch	Goodyear	....	106	Oilzum
Ogren	Mason	4	3.656	7.00	292	Rajah	Miller	Bosch	Goodrich	33x4½	106	Oilzum
Mercer	Schillo	4	3.872	6.375	300.7	Bosch and Rajah	Miller	Bosch	Goodyear	33x5—32x4½		Oilzum
Delage	Durant	4	3.78	6.00	280	A.C.	Miller	Miller and Bosch	Goodyear	33x5		Oilzum
Erbes	Andy Burt	4	3.638	7.125	295	....	Miller	Bosch	Silvertown	33x4½		Oilzum
Duesenberg	Diedrich	4	3.75	6.75	299	A.C.	Miller	Bosch	Goodyear	32x4½—34x4½	106½	Oilzum

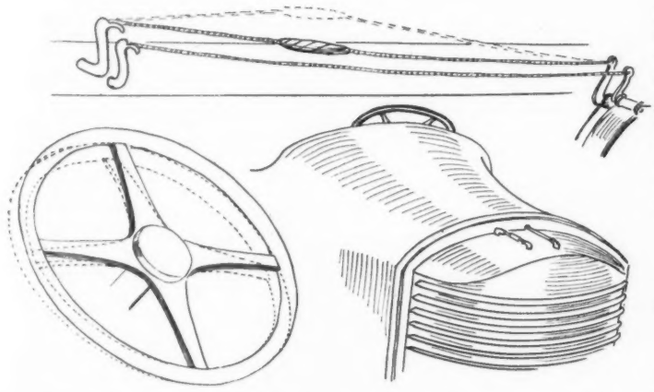
All cars were equipped with Rudge wire wheels except the two Ogren cars driven by Henning and Mason, which carried Houk wheels. All cars were fitted with Goodyear cord tires except the Oldfield Special, Erbes Special, and Henning's Ogren, which carried Firestone, Goodrich Silvertown and Goodrich Silvertown tires, respectively. Oldfield used Firestones at the start of the race but early in the race changed the rears to Goodyears. Hartford shock absorbers were found on all the cars except the Mercedes and Detroit Special, which were fitted with Mercedes and Mondex, respectively. Every car carried a Boyce Moto-Meter except Alley's Pan-American. The following used Dixon's graphite lubrication: Chevrolet, Boyer, Durant, Hearne, Milton, Toft, Henning, Mulford, Vail, Patterson and Oldfield. The Hudson team also used Whitmore lubricants

verse shaft of which carried at one end a ball arm and drag link to the left steering knuckle, and at the other a spur gear. The latter meshed with another gear of exactly the same size mounted upon a short shaft extending over the frame of the car, to which was fastened a second ball arm. This was connected up to the right steering spindle with a similar drag link as on the other side. In fitting this system of steering it was stated that the car would have a greater factor of safety inasmuch as in case one steering arm broke, the other would still hold. Also, much strain is taken off the front spindles by having the push on one and a pull on the other.

The Frontenac cars, which were the lightest cars entered, possessed many features not usually found on high speed cars. There was a total absence of brake levers, the brakes being operated by a pedal as usual, and any additional braking being supplied by the driver or mechanic reaching over the side of the car and grasping the taped portion of the cable which actuated the other set of brakes. The cable passed from one side of the car to the other so that either the driver or mechanic could operate it. Chevrolet had also fitted to the Frontenac a flexible steering wheel which was designed to relieve the driver's wrist from all shocks. The spider of this wheel was made out of thin spring steel, which made it very flexible—at the same time strong enough for high speed work. Provision was also made on the Frontenac for cooling the oil, and this consisted of a series of fins fastened to the oil tank in such a position that a current of air struck them continuously while the car was in motion. It was this tank on Chevrolet's car that sprung a leak, and being directly over the clutch caused the latter to slip, inasmuch as it was of the cone type.



Layout of special steering gear used on Oldfield's new car. If the linkage on one side should break the rest of the linkage prevents the wheels from springing out of line and thus causing an accident



Three features of the Frontenacs. Above is the brake cable, the dotted lines showing how the mechanic can operate the brake by pulling up on the taped portion. Below, at the left, is the steering wheel, the spider of which is made of thin spring steel to absorb shocks transmitted through the steering column. At the right the method of cooling the oil by means of fins around the tank under the hood is illustrated

U. S. Makers Build Plants in Canada

To Escape Customs Taxes — Have Installed Machinery to Turn Out Complete Cars —Employees Brought from U. S.

ESTABLISHMENT of branch automobile factories in Canada, which has been a common move during the past 12 months, is regarded by many as a wise procedure, and as one large manufacturer states, "Is very good business at this time."

The majority of the companies which have built Canadian branches have been actuated by the desire to escape duty taxes. Erection and maintenance of a branch factory in Canada, where considerable assembly and some manufacturing are done, is a means of eliminating and avoiding the usual customs taxes, and allows the maker to sell his product in Canada at the same price as in the United States.

Another stimulant to the Canadian branch building activities has been the possibility of a preferential customs tax after the war arranged between Canada and the various English Allies, which many makers foresaw and sought to avoid with their Canadian branches. They feared a discrimination against the United States which would close foreign fields to American made cars. This, however, is now regarded by the majority of manufacturers as a past possibility, one that might have occurred if the United States had not entered the war. But there are still some who believe that the possibility of a discriminating preferential customs tax still remains, and these men state that it is "good business" to erect a Canadian factory branch, because it not only exempts the products of that factory from the customs, but also places the American maker in a position of safety if Canada receives the benefit of a preferential customs following the war.

All the companies operating Canadian branches do both assembling and manufacturing, and have installed machinery capable of turning out complete products. The various automobile makers are manufacturing cars exactly like those made in the United States factories and sell them at the regular United States prices.

There is a labor shortage in Canada at present, caused by the war conditions, and many of the plants have installed women workers, who are surprising their employers by the efficient work they perform both in offices and machine shops. Many of the American makers have exported American workers to the Canadian branches to complete their working organizations.

Among the motor car and parts makers who have erected or are erecting Canadian plants are the Ford Motor Co., Ford, Ont.; Willys Overland Co., West Toronto; Maxwell Motor Co., Windsor, Ont.; Studebaker Corp., Windsor; Chevrolet Motor Co., Oshawa, Ont.; Crow Motor Co., London, Ont.; Chalmers Motor Co., Walkerville, Ont.; Saxon Motor Co., Windsor; Dodge Bros., Windsor; Harroun Motors Corp., Windsor; Signal Motor Truck Co., Toronto; Fisher Body Corp., Walkerville; Champion Spark Plug Co., Windsor; Detroit Weather Proof Body Co., Toronto; Kelsey Wheel Co., Toronto; S.K.F. Ball Bearing Co., Toronto; Goodyear Tire & Rubber Co., East Toronto; Marathon Tire & Rubber Co., St. Catharines; Acme Tire & Rubber Co., Toronto.

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Motor Vehicles on P. O. Star Routes

THE Post Office Department is now ready to extend the use of motor vehicles to the star route service.

This latter service is one which has to do with the carrying of mail in closed pouches from one post office to another, or from an office on the railroad to one not located on the railroad.

Heretofore motor machines have been used only in cities and in the rural service, or the one which carries mail to individual patrons. Beginning July 1, hundreds of motor vehicles will be put in use on star routes, advance notice of which is being given out by the department.

Aircraft Standardization Premature?

Dr. Dantzig Tells Indiana Section of S. A. E. That Standardization of Parts at Present Stage of Design Would Retard Future Development

INDIANAPOLIS, June 16—Dr. Tobias Dantzig, instructor of mathematics at Indiana University, and a graduate of the Aeronautical Institute of Paris, discussed the subject, "The Future of the Airplane and the Principles of Airplane Construction," before the Indiana section of the Society of Automotive Engineers at the Claypool Hotel last night. The meeting, which was the last of the year, was attended by the largest crowd in the history of the Indiana section. Officers for next year were elected as follows:

Chairman, F. A. Cornell, assistant general sales manager of the Cole Motor Car Co.; vice-chairman, Charles S. Crawford, chief engineer of the Premier Motor Corp.; secretary, Frank E. Smith, of the Universal Motor Products Co.; treasurer, C. E. Jeffers, designing engineer, Nordyke & Marmon Co., and the fifth member of the board of directors, F. E. Moskovics, commercial manager of the Nordyke & Marmon Co.

Studied in French Factories

Dr. Dantzig had prepared to present an impromptu discussion of airplane construction, which was to have been illustrated with stereopticon slides, but an unfortunate misunderstanding resulted in no operator for the machine being present and, as a result, his discussion of the subject was not complete in all details. The speaker displayed two airplane models—one a Curtiss biplane military tractor and a monoplane, patterned after the German type. He has spent considerable time in French airplane factories, and he told of the general principles adopted there for the construction of military machines.

Opposes Airplane Standardization

After explaining the mechanical features of the two models, Dr. Dantzig attacked the proposal of American engineers to standardize airplane parts, and this attack was the subject of much subsequent discussion.

"I am opposed to the proposed standardization of airplanes," he said. "The airplane may be said to be just beginning to enter a stage of productive evolution, and to seek to standardize the parts now would mean that future development would be retarded greatly.

"What would have happened to the automobile industry if parts had been standardized in the beginning? The development would not have been nearly so rapid. It would be a mistake to standardize airplane parts at this time, when scarcely any perfect mechanism for construction has been developed except the adopted mechanism of control. Standardization at this time would retard the development of the airplane.

Future Uses Practical

"Airplanes are to have a wider radius of practical use than for mere sport and pleasure, just as the automobile has been developed into a commercial vehicle. Airplanes will be used for carrying passengers and mail and for exploring parts of the world of which we know little.

"It is not my belief that airplanes ever will be used for the transportation of freight. This would not be practical from an engineering standpoint. It is true that twenty machines carrying one passenger each will expend less fuel than one machine which is made to carry twenty passengers, thus showing that it would not prove practical to fly with freight.

"The airplane will take the place of the automobile for sport eventually. People will become more accustomed to them as they become more numerous. They will be developed to assure safety and they will have the advantage of the automobile in that their successful operation will not demand the construction and maintenance of costly highways. The dangers of collision present in the automobile are removed in the airplane because the latter is a three-dimension machine, which can travel longitudinally, up or down, while the automobile can travel in only one direction.

"The automobile industry is the one industry to develop the airplane. Automobile factories may easily be converted into airplane factories and, as far distant as such a policy may seem now, it is very probable that many automobile plants will be converted into airplane factories in a few months if the demands of the army and navy are to be met. Automobile engineers should begin now to study flying problems—you may need the knowledge much sooner than you expect."

Urges Aero Club Branch

Dr. Dantzig urged the Indiana automobile engineers to attempt to have a branch of the Aero Club of America established at the Indianapolis Motor Speedway, which he declared is fitted admirably for that purpose. He could not understand, he said, why the Government should have failed to accept the speedway as a site for an aviation school. It is larger than the aerodrome in Paris, he said, and should be utilized for the training of aviators.

Following the address, Charles C. Crawford, chief engineer of the Premier Motor Corp., entered into a discussion of Dr. Dantzig's remarks opposing the standardization of airplane parts.

"I don't think Dr. Dantzig understands this proposal to standardize airplane parts," Mr. Crawford said. "Such an action is necessary now to meet wartime requirements, and even in peace times the standardization of parts would not retard development. Automobile parts are standardized—that is, we have accepted principles on which to work for a time—but despite this we are all constantly working for something better, and when we make an improvement it is adopted as a part of the standardization. The development of the automobile has not been retarded as a result of standardization."

To Print Papers

Mr. Crawford, who was chairman of the section last year, expressed regret that so few of the papers read before the section had been printed. He read a special delivery letter he had received from F. A. Cornell, who will serve as chairman next year, stating he already had made arrangements for three speakers to appear, and that they intend to devote much time to research work in preparing their papers. Officers of the club promised the membership that all papers for next year will be printed in advance of the meetings.

U. of W. Session Begins June 25

MADISON, WIS., June 19—The nineteenth annual summer session of the College of Engineering of the University of Wisconsin will be held here during the 6 weeks' period beginning June 25.

Special courses will be given in chemistry, electrical, steam, and hydraulic engineering, gas engines, machine design, mechanical drawing, mechanics, shop work and surveying. All courses given in the university summer session are open to engineering students.

U. S. Needs Cars at Camps

WASHINGTON, June 18—Inquiry at the War Department as to the possible use for passenger automobiles being bought by the Government in large numbers elicited the information that these machines will be needed for the use of officers of the Quartermaster's Corps, for messenger service and in various other ways, especially at the cantonments to be built for the training of the new army. These cantonments will take care of 30,000 men each, and this means a great number of officers for instruction purposes.

Sales Congress Studies Intensive Methods

World's Salesmanship Organization Plans Establishment of Chairs in Universities as Part of Its Educational Campaign—To Continue Lectures

DETROIT, June 16—The same intensive study of selling that has been given to manufacturing was the big thought in the sessions of the World's Salesmanship Congress which held its second annual meeting here this week.

Thousands of dollars and much time have been devoted by corporations to perfecting manufacturing methods and reducing costs while the division of the business which must sell the goods and support the manufacturing end has been given comparatively scant consideration. Laboratories for research have been established to handle manufacturing problems while salesmen in sales departments have been permitted to go their way with almost no attempt to bring them to the same high state of efficiency that is sought in engineering and production.

Practice and Theory Considered

Many of the speakers at the congress demonstrated the results that can be secured through a study of the sales end of the business and both practice and theory were thoroughly gone into by men who have been successful as business and sales executives.

It was the end of the first year of the existence of the congress, which was formed in this city last July. Its mission, as expressed in its motto, is the betterment of business through better selling.

During the first year, the congress has succeeded in forming salesmanship clubs in forty-five cities, the total membership of which is 16,000, and it is hoped to secure 100,000 members before the end of the second year. In order to continue the work, it is proposed to begin at once an intensive campaign to raise $100,000.

If this sum is raised, the congress will continue its educational work, part of which is the establishment of chairs in universities and the modification of present curricula so that students may be fitted for efficient work in the business world when they leave schools and colleges. As courses of study are now conducted, students do not make efficient workers in the business world when they leave institutions of learning.

The congress will also continue its work of sending lecturers to the various salesmanship clubs to talk and lead discussions on subjects pertaining to sales work.

From Factory to Buyer

Many phases of industry were covered and the possibilities of development were pointed out. The speakers in their discussion of salesmanship went back into the factory where the goods are made and followed sales methods down to the consumer and the after-service that is necessary if the buyer is to be satisfied with his goods.

One speaker went so far as to predict that in 10 years, corporations would be getting 100 per cent more results with half the number of sales people, if the present movement were carried through. The automobile men in this city took an active part in the congress and one of the afternoon sessions was devoted to the automobile business. Much of the discussion was on what the laymen might consider as real, practical work, but there was also included the theoretical and advanced thought. Character analysts analyzed men on the speakers platform and explained the principles of this comparatively new science.

At the close of the session, Edward N. Hurley, former chairman of the Federal Trade Commission and now engaged in Red Cross work, gave a message to the business world in which he urged all to co-operate and take an interest in public affairs for the greater efficiency of the nation as a whole.

The congress opened Sunday with sermons in the principal churches by business men. The sessions opened formally Monday morning with an address by Charles M. Schwab, head of the Bethlehem Steel Co. The congress met morning, afternoon and evening, closing Thursday evening. With the exception of Monday afternoon, when eleven departmental sessions were run at the same time, the congress held but a single meeting, so that all the lectures and discussions were available for every delegate.

Norval A. Hawkins, sales manager of the Ford Motor Co., was re-elected president, but he said that when the financing of the congress is completed, which will be about July 15, he will resign in order that the organization may not become a one-man affair. Secretary-Manager D. M. Barrett was retained on a 5-year contract. St. Louis appeared with a large delegation and made a bid for next year's meeting. While the place of the next meeting has not been chosen, most of the members seemed in favor of St. Louis and it is considered not unlikely that the executive committee will select this city, after the financing plan is completed and some other details of the plan are perfected.

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Timken-Detroit Co-operative Grocery Store Growing Rapidly

THE co-operative grocery store of the Timken-Detroit Axle Co., establishment of which was announced in a previous issue of THE AUTOMOBILE, is developing rapidly and proving to be a success. The store started with 200 members, each of whom paid a membership fee of $5 to supply working capital. The present membership numbers 316 and includes only employees of the company who are married or have dependents. A reduction in the membership fee of $2.50 has been made, and when the membership reaches 1000, $2.50 will be returned to each of the original 200 members.

The store now handles practically everything in the grocery line, including flour, butter, potatoes, hams, bacon, sausages, frankfurters, lard, eggs, tobaccos, oranges, apples and other fresh fruits, and these are sold at cost, which represents between 5 per cent and 10 per cent above the purchase price, depending upon the perishable quality of the goods.

In the 27 business days during March a total business of $2,504.17 was transacted, an average of $92.70 per day. This was all a cash business, and on this basis it is estimated that the complete capital is turned twice monthly.

Groceries are purchased from local jobbers, but some canned goods have been secured directly from canners and farm produce directly from growers. The members of the store use a system of coupon books which are in $3 and $5 values. A member can secure these books by signing his name to a slip which is attached to the book and the money is deducted from his pay.

An average saving of 20 per cent is now made by each member on his purchases, while in some instances with such articles as coffee and tea there is a saving of 25 per cent to 40 per cent. It is anticipated that in the near future the store will stock clothing, shoes, coal, furniture and household furnishings, or will be in a position to supply these articles to its members by dealing directly with the manufacturers and mines with a profitable saving effected. The store is open from 6.30 to 7 a. m.; 12 to 1 noon; 4.48 to 6 p. m., and 11.30 to 12 midnight.

The store is managed by a supervising committee elected by members, and they donate their time without cost. A nominal rent is paid to the company for the use of the store room, and the store carries its own insurance.

Details of German Aviation Engines

Elaborate Design and Fine Workmanship Characterize Benz and Mercedes Motors—Better Power Output Obtained From Later French and British Engines

By E. H. Sherbondy
Engineering Department, Peerless Motor Car Co.

EDITOR'S NOTE.—*The great length of this paper, presented to the Cleveland section of the Society of Automotive Engineers, somewhat restricted discussion, additional time being consumed in showing some motion pictures of White motor trucks in military service. The following extracts represent the major portion of the paper, which is a useful analysis of the details of some most famous engines.*

IN October, 1909, Farman succeeded in flying 3 hr. 4 min. with a Gnome motor. It was this year that Glenn Curtiss went to France and astounded the world by carrying off the Gordon Bennett Cup with a Curtiss biplane driven by a Curtiss engine 3¾-in. bore and 3¾-in. stroke. This motor is said to have weighed 200 lb. and gave 35 hp. at 1000 r.p.m. It was also in 1909 that Louis Bleriot succeeded in flying across the channel in a Bleriot monoplane driven by a three-cylinder 25-hp. Anzani motor. The flight was made in barely ½ hr. and it was immediately after this flight that the British War Office first became interested in the military possibilities of heavier than air machines. Shortly after this Lord Northcliffe organized the Daily Mail Contest Prize, which was $25,000 and was won by Col. Cody for a flight from London to Manchester. From this time on considerable interest in aviation was manifest in all European countries and each of the various governments took it upon itself to not only investigate the military possibilities of aviation but also afforded substantial support to the builders of airplanes and airplane motors. This is particularly true of Germany, where in 1913 there was organized the Kaiser Prize Contest for the best aviation motor that could be developed. In addition to prize contests, substantial subsidies were arranged for firms capable of building aviation motors, and this not only stimulated but made possible the development of such motors as the Mercedes and Benz in Germany.

Size and Speed Increase

The size of the planes and the speed have increased by leaps and bounds during the period of the war. The facility with which man now flies is almost equal to that of birds. The largest sized successful airplane motor built up to 1909 was the 100-hp. Antoinette. This year planes have been flown with a total of 1700 hp.

It was my good fortune to secure from Baron Charles Huard two of the aviation motors which were shot down in France during the last year. These motors I have had dismantled and am now able to give the full particulars of 170-hp. Benz and another motor of the Mercedes type, which is a twin six and which was probably built by Renault.

The 150-hp. six-cylinder Mercedes motor is 140-mm. bore and 160-mm. stroke. This type of motor won all the important places in the Kaiser prize contest with the exception of the first prize, which went to the Benz. The Mercedes company started with smaller cylinders, namely, 100-mm. bore and 140-mm. stroke, six cylinders. The principal features of the design are forged steel cylinders with forged steel elbows for gas passages, pressed steel water jackets, which when welded together forms the cylinder assembly, the use of inclined overhead valves operated by means of an overhead camshaft through rocker arms which multiply the motion of the cam. By the use of steel cylinders, not only is the weight greatly reduced but certain liability to distortion through unequal sections, leaks and cracks is entirely avoided. The construction is necessarily very expensive. It is certainly a sound job. In the details of this construction there are a number of important things, such as finished gas passages, water-cooled valve guides and a very small mass of metal which is water-cooled surrounding the spark plug. Of course, it is necessary to use very high compression in aviation motors in order to secure high power and economy and, owing to the fact that aviation motors are worked at nearly their maximum, the heat flow through the cylinder, piston and valves is many times higher than that encountered in automobile motors. It has been found necessary to develop special types of pistons to carry the heat from the center of the head in order to prevent pre-ignition.

Forged Steel Piston Heads

In the Mercedes motor the pistons have a drop-forged steel head which includes the piston pin boss; this head is screwed to a cast iron skirt which has been machined inside to secure uniform wall thickness.

The carbureter used on this 150-hp. Mercedes motor is precisely of the same type used on the twin six motor which I shall hereafter describe. It has two venturi throats, in the center of which is placed the gasoline spray nozzle of conventional type, fixed size orifices, immediately above which are placed two panel type throttles with side outlets. An idling or primary nozzle is arranged to discharge above the top of the venturi throat. The carbureter body is of cast aluminum and is water jacketed. It is bolted directly to air passage passing through the top and bottom half of the crankcase, which passes down through the oil reservoir. The air before reaching the carbureter proper has to some extent cooled the oil in the crank chamber and has itself been heated to assist in the vaporization. The inlet pipes themselves are copper. All the passages between the venturi throat and the inlet valve have been carefully finished and polished. The only abnormal thing in the design of this motor is the short connecting-rod which is considerably less than twice the stroke and would be considered very bad practice in motor car engines. A short connecting-rod, however, possesses two very real virtues, in that it cuts down height of the motor and the piston passes over the bottom dead center much more slowly than with a long rod.

Other features of the design are a very stiff crankcase, both halves of which are bolted together by means of long through bolts, the crankshaft main bearings are seated in the lower half of the case instead of in the usual caps and no provision is made for taking up the main bearings. The Mercedes company uses a plunger type of pump having mechanically operated piston valves and it is driven by means of worm gearing.

Light Camshaft Construction

The overhead camshaft construction is extremely light. The camshaft is mounted in a nearly cylindrical cast bronze case and is driven by means of bevel gears from the crankshaft. The vertical bevel gear shaft through which the drive is taken from the crankshaft to the camshaft operates at one and one-half times the crankshaft speed and the reduction to the half time camshaft is secured through a pair of bevels. On this vertical shaft there is mounted the water pump and a bevel gear for driving two magnetos. The water pump mounted on this shaft tends to steady the drive and avoid vibration in the gearing.

The following are the cylinder sizes of six-cylinder aviation motors which have been built by Mercedes:

Bore, mm.	Stroke, mm.	H.P.
105	140	100
120	140	135
140	150	150
140	160	160

The largest of these motors, last on the table above, has recently had its power increased to 176 hp. at 1450 r.p.m. This general design of motor has been the foundation for a great many other aviation motor designs, some of which have proved very successful but none of which, in the writer's estimation, are equal to the original. Among the motors which follow more or less closely the scheme of design and arrangement are the Hall-Scott, Wisconsin, Renault, Packard, Christofferson and Rolls-Royce. Each of these motors shows considerable variation in detail. The Rolls-Royce and Renault are the only ones which have used the steel cylinder with the steel jacket. The Wisconsin motor uses an aluminum cylinder with a hardened steel liner and cast iron valve seats. The Christofferson has somewhat similar design to the Wisconsin with the exception that the valve seats are threaded into the aluminum jacket and the cylinder head has a blank end which is secured to the aluminum casting by means of the valve seat pieces. The Rolls-Royce motors show small differences in details of design in cylinder head and camshaft housing from the Mercedes, on which they have taken out patents, not only abroad but in this country.

The Renault Motor

The V-type twin-six Renault motor is 125 mm. bore and 160 mm. stroke. The first important peculiarity of this design is a small angle between the cylinders which is only 47½ deg., and enables the fuselage to be considerably narrowed in width, thus reducing the head resistance. The cylinders of this motor are almost a duplicate of the Mercedes design of steel cylinder with the exception that the elbows in which the valves are inserted are not so carefully designed and the water jacket is carried around only one side of the exhaust valve stem, whereas in the Mercedes motor the waterjacket completely surrounds the exhaust valve stem. It appears to be absolutely essential to cool the exhaust valve as much as possible, since pre-ignition is likely to occur always from one of three sources, the spark plug, which is the arch offender, the exhaust valve or the center of the piston head. There are two valves for a cylinder only 66 mm. or about 2⅝ in. in diameter. The valve port is 61 mm. or 2 13/32 in. The inlet to the elbow is 53 mm. in diameter. The valve stems are both 11 mm. or 7/16 in. diameter, with a head approximately 5/32 in. thick and a 45 deg. angle seat ⅛ in. wide.

Wide Valve Seats Essential

It is important in aviation motors to have considerable width of seat, as it greatly assists in carrying the heat off the exhaust valve. The end of the valve stem is threaded to carry the spring cup and lock nut. Each of the cylinder bands together with the head is machined from a forged bar, after which the intake and exhaust elbows are welded on and finally the pair of cylinders are encased in a jacket which is welded up from three pieces of steel approximately 1/32 in. thick. The cylinder walls themselves are 3 mm. or 7-64 in. thick. A standard two-bolt flange is used for all intake and exhaust port connections and has been profile milled out of steel. The flanges are screwed on to the cylinders and welded and brazed on to the intake and exhaust pipes.

The pistons are of cast iron and are the only very heavily designed pieces in the motor, and it certainly seems as though these could have been considerably lightened. The piston carries three concentric rings which are pinned at the ring gap and have a deep annular rib between the bosses. The pistons are also unsually short, only 95 mm. in length. Piston pin is 38 mm. in diameter [illegible] ⅛-in. wall and is locked with a single set screw [illegible] pin. There are eighteen 11/32 in. holes drilled into the skirt, but these holes must have been drilled for oiling purposes, as they do not materially reduce the weight of the piston.

The connecting-rods are of the articulated type and the short rod is alternately arranged from right to left cylinder from the front of the motor to the back.

The connecting-rods are made of B. N. D. steel I-beam section with a flange and web of 2 mm. thickness. The flanges are 26 mm. and the web is 34 mm. wide. In the short connecting-rod both ends of the rod are alike. The length of the rod is 300 mm. or 11 13/16 in. The rod cap is secured by means of three bolts, two 11 mm. in diameter and one of 14 mm. in diameter.

Crankshaft Carried in Four Bronze Shells

The crankshaft is carried in four babbitt-lined bronze shells, which in turn are secured to ribbed steel bearing caps. The bearing caps are locked in the top of case by means of long U-bolts, such as are sometimes used on automobile spring saddles. The crankshaft has a diameter of 60 mm. with the exception of the propeller shaft end, where the diameter is increased to 68 mm. The crankpins and main bearings are 72½ mm. long with the exception of the bearing in propeller end, which is 92 mm. long. The shaft is drilled out for lightness, but oil is carried from the main bearings by means of thrower rings and separate small steel pipes to the connecting-rod big ends. The front end of the crankshaft is splined to mount the starting gear and accessory drive. The water pump is mounted on the front of the motor from the bottom half of the crank chamber, and has an ingeniously designed double runner with double collecting chambers. The water is piped to either side of the motor; though copper pipes and rubber connections are interposed to prevent cracking joints due to vibration.

The carbureter only differs from the Mercedes in that it uses a single float chamber instead of two float chambers. There are two carbureters mounted on either side of the motor bolted to either side of the crankcase by means of long studs and the intake pipes, which are fastened by means of unions to the carbureter, are made of copper tubing, 48 mm. in diameter.

The carbureter has a pair of primary nozzles and a pair of secondary nozzles and an auxiliary air valve which consists of an annular ring mounted concentric with a venturi throat. It would seem that this auxiliary air valve was a dangerous construction to go up in the air with, as it is very likely to stick.

Oil is carried through cast ducts in the front and rear compartments of the crank chamber to the main bearings. It is also carried from these ducts through two copper tubes up to the overhead camcase and passes through the camshaft case from the propeller to the starting end of the motor and returns down through the distributing gearing case to the oil sump.

The valve gear is of very elaborate, expensive design. The main scheme of the construction is to use a light steel tube, carried on the studs from the cylinder head, which is slotted to take bronze cages which form both the camshaft bearings and rocker arm mountings. The rocker arms are arranged to multiply the cam motion so that the valve opens 12 mm. The camshafts are driven through straight bevel gears and the driving shaft driven through straight bevel gears of 12½ mm. face three module pitch, and the inclined shafts which drive the camshafts operate at three times camshaft speed. The high speed of these shafts and the resultant lowering in torque on them allow their weight to be considerably decreased.

Gearing Cheap and Light

At first sight it would seem that the construction of gearing in the Renault motor is a very complicated and expensive one, but this arrangement turns out cheaper and very much lighter than where a train of spur gears is used for driving magnetos, camshafts, etc. The Peugeot company introduced the use of spur gears for overhead camshaft driving and this construction has been copied by Sunbeam, Wisconsin and Packard. In a twin six, or an eighteen-cylinder motor, the number of gears necessary with this gearing arrangement forms a maze of complications. The Rolls-Royce, Hispano-Suiza, Hall-Scott, and Christofferson used bevel gears for driving the camshaft. All these designs are more or less an imitation of the original Mercedes. A few of the imitators seem to have grasped the importance of operating the auxiliary shaft of the magneto driving arrangements. There are four magnetos mounted on the same axis, each pair being

driven through a spur gear, which in turn meshes with a spur gear which is slidably mounted on a splined magneto driveshaft. The magneto driveshaft terminates at its forward end in the sleeve of a bevel gear and is helically splined into the bevel gear so that when longitudinally displaced the shaft is also angularly displaced. This construction is quite costly but is the best one the writer has seen, since it avoids a lot of connections to magneto breaker boxes and it also insures a spark of the same intensity regardless of whether the ignition is advanced or retarded.

At the front end of the crankshaft there is mounted an aluminum six-cylinder air starting motor which engages the crankshaft by means of an overrunning clutch. This air starting motor has a single inlet discharge valve for six cylinders of the rotating disk type. There is also built integral with this starter a hand starting gear and the starting magneto drive.

The Benz Motor

In the Kaiser prize contest for aviation motors a four cylinder Benz motor of 130 by 180 mm. won first prize, developing 103 b.hp. at 1290 r.p.m. The fuel consumption was 210 grams per horsepower hour. Total weight of the motor was 153 kilograms. The oil consumption was .02 of a kilogram per horsepower hour. This motor was afterward expanded into a six-cylinder design and three different sizes were built.

The accompanying table gives some of the details of weight, horsepower, etc.

Motor type	B	FD	FF
Rated horsepower	85	100	150
Horsepower at 1250 r.p.m.	88	108	150
Horsepower at 1350 r.p.m.	95	115	160
Bore in millimeters	106	116	130
Stroke in millimeters	150	160	180
Offset of the cylinders in millimeters	18	20	20
Rate of gasoline consumption in grams	240	230	225
Oil consumption in grams per b.h.p. hour	10	10	10
Oil capacity in kilograms	36	4	4½
Water capacity in litres	5½	7½	9½
The weight with water and oil but with two magnetos, fuel feeder and air pump in kilograms	170	200	245
The weight of motors, including the water pump, two magnetos, double ignition, etc.	160	190	230
The weight of the exhaust pipe complete in kilograms	4	4.8	5½
The weight of the propeller hub in kilograms	3½	4	4

The Benz cylinder is a simple, straightforward design and a very reliable construction and not particularly difficult to manufacture. The cylinder is cast of iron without a water jacket but including 45-deg. angle elbows to the valve ports. The cylinders are machined wherever possible and at other points have been hand filed and scraped, after which a jacket, which is pressed in two halves, is gas welded by means of short pipes welded on to the jacket. The bottom and the top of the cylinders become water galleries, and by this means separate water pipes with their attendant weight and complication are eliminated. Rubber rings held in aluminum clamps serve to connect the cylinders together. The whole construction turns out very neat and light. The cylinder walls are 4 mm. or 3/16 in. thick and the combustion chamber is of cylindrical pancake form and is 140 mm. or 5½ in. in diameter. The valve seats are 68 mm. in diameter and the valve port is 62 mm. in diameter.

Valve Stems in Two Diameters

The passage joining the port is 57 mm. in diameter. In order to insert the valves into the cylinder the valve stem is made with two diameters and the valve has to be cocked to insert it in the guide, which has a bronze bushing at its upper end to compensate for the smaller valve stem diameter. The valve stem is 14 mm. or 9/16 in. in diameter and is reduced at its upper portion to 9½ mm. The valves are operated through a push rod and rocker arm construction, which is 7-16 in. and exceedingly light. Rocker arm supports are steel studs with enlarged heads to take a double row ball bearing. A roller is mounted at one end of the rocker arm to impinge on the end of the valve stem, and the rocker arm has an adjustable globe stud at the other end. The push rods are light steel tubes with a wall thickness of 0.75 mm. and have a hardened steel cup at their upper end to engage the rocker arm globe stud and a hardened steel globe at their lower end to socket in the roller plunger.

The Benz camshaft has a diameter of 26 mm. and is bored straight through 18 mm. and there is a spiral gear made integrally with the shaft in about the center of its length for driving the oil pump gear. The cam faces are 10 mm. wide. There is also, in addition to the intake and exhaust cams, a set of half compression cams. The shaft is moved longitudinally in its bearings by means of an eccentric to put these cams into action. At the fore end of the shaft is a driving gear flange which is very small in diameter and very thin. The flange is 68 mm. in diameter and 4 mm. thick and is tapped to take 6 mm. bolts. The total length of camshaft is 1038 mm., and it becomes a regular gun boring job to drill a hole of this length.

The camshaft gear is 140 mm. or 5½ in. outside diameter. It has fifty-four teeth and the gear face is 15 mm. or 19-32 in. The flange and web have an average thickness of 4 mm. or 5/32 in. and the web is drilled full of holes interposed between the spur gear mounted on the camshaft and the camshaft gear. There is a gear which serves to drive the magnetos and tachometer, also the air pump. The shaft is made integrally with this gear and has an eccentric portion against which the air pump roll plunger impinges.

Crankshaft Has Beautiful Finish

The seven-bearing crankshaft is finished all over in a beautiful manner, and the shaft out of the particular motor we have shows no signs of wear whatever. The crankpins are 55 mm. in diameter and 69 mm. long. Through both the crankpin and main bearings there is drilled a 28-mm. hole, and the crank cheeks are plugged with solder. The crank cheeks are also built to convey the lubricant to the crankpins. At the fore end of the crank cheek there is pressed on a spur driving gear. There is screwed on to the front end of the shaft a piece which forms a bevel water pump driving gear and the starting dog. At the rear end of the shaft very close to the propeller hub mounting there is a double thrust bearing to take the propeller thrust.

Long, shouldered studs are screwed into the top half of the crankcase portion of the case and pass clean through the bottom half of the case. The case is very stiff and well ribbed. The three center bearing diaphragms have double walls. The center one serves as a duct through which water pipe passes, and those on either side of the center form the carbureter intake air passages and are enlarged in section at one side to take the carbureter barrel throttle.

The pistons are of cast iron and carry three concentric rings ¼ in. wide on their upper end, which are pinned at the joint. The top of the piston forms the frustum of the cone and the pistons are 110 mm. in length. The lower portion of the skirt is machined inside and has a wall thickness of 1 mm. Riveted to the piston head is a conical diaphragm which contacts with the piston pin when in place and serves to carry the heat off the center of the piston.

The oil pump assembly comprises a pair of plunger pumps which draw oil from a separate outside pump, and constructed integrally with it is a gear pump which delivers the oil under about 60 lb. pressure through a set of copper pipes in the base to the main bearings. The plunger oil pump shows great refinement of detail. A worm wheel and two eccentrics are machined up out of one piece and serve to operate the plungers.

Sunbeam Aviation Motor

Since 1914 the Sunbeam company has produced engines of six, eight, twelve and eighteen cylinders from 150 to 500 hp. with both iron and aluminum cylinders. For the last 2 years all the motors have had overhead camshafts with a separate shaft for operating the intake and exhaust valves. Camshafts are connected through to the crankshaft by means of a train of spur gears, all of which are mounted on two double row ball bearings. In the twin six, 350-hp. engine, operating at 2100 r.p.m., it requires about 4 hp. to operate the camshafts. This motor gives 362 hp. at 2100 revolutions and has a fuel consumption of 51/100 of a pint per brake horsepower hour. The cylinders are 110 by 160 mm. The same design has been expanded into an eighteen-cylinder, which gives 525 hp. at 2100 turns. There has also been developed a very successful eight-cylinder motor rated at 220 hp., which has a

bore and stroke of 120 by 130 mm., weight 450 lb. This motor is an aluminum block construction with steel sleeves inserted. Three valves are operated, one for the inlet and two for the exhaust. One camshaft operates the three valves. This motor is very successful, and besides being built by the Sunbeam company is also being produced by the Austin Motor Company.

The modern Sunbeam engines operate with a mean effective pressure of 135 lb. with a compression ratio of 6 to 1. The connecting-rods are of the articulated type, as in the Renault motor, and are very short. The weight of these motors turns out at 2.6 lb. per b.hp., and they are able to go through a 100-hr. test without trouble of any kind. The lubricating system comprises a dry base and oil pump for drawing the oil off from the base, whence it is delivered to the filter and cooling system.

It then is pumped by a separate high pressure gear pump through the entire motor. In these larger European motors castor oil is used largely for lubrication. It is said that without the use of castor oil it is impossible to hold full power for five hours. Coatalen favors aluminum cylinders rather than cast iron.

Curtiss Motors

The Curtiss OX motor has eight cylinders, 4 by 5 in., delivers 90 hp. at 1400 turns, and the weight turns out at 4.17 lb. per horsepower. This motor has cast iron cylinders with monel metal jackets, overhead inclined valves operated by means of two rocker arms, push and pull rods from the central camshaft located in the crankcase. The cam and push rod design is extremely ingenious and the whole valve construction turns out very light. This motor is an evolution from the early Curtiss type motor which was used by Glenn Curtiss when he won the Gordon Bennett Cup at Rheims. A slightly larger edition of this type motor is the OXX, which has cylinders 4¼ by 5, delivers 100 hp. at 1400 turns and has the same fuel and oil consumption as the OX type motor, namely, 0.6 lb. of fuel per b.hp. hour and 0.03 lb. of lubricating oil. The Curtiss company has developed in the last 2 years a larger sized motor, now known as the V-2, which was originally rated at 160 hp. and which has since been refined and improved so that the motor gives 220 hp. at 1400 turns, with a fuel consumption of 52/100 lb. per b.hp. hour and an oil consumption of 0.03 lb. per b.hp. hour. This larger motor has a weight of 3.45 lb. per horsepower and is now said to be giving very satisfactory service. This V-2 motor has drawn steel cylinders with a steel water jacket top and a monel metal cylindrical jacket, both of which are brazed on to the cylinder barrel itself. Both these motors use side by side connecting-rods and fully forced lubrication. The camshafts act as a gallery from which the oil is distributed to the camshaft bearings, the main crankshaft bearings and the gearing. Here again we find extremely short rods, which, as before mentioned, enable the height and the consequent weight of construction to be very much reduced. For ordinary flying at altitudes of 5000 to 6000 ft., the motors are sent out with an aluminum liner, bolted between the cylinder and the crankcase in order to give a compression ratio which does not result in pre-ignition at a low altitude. For high flying, however, these aluminum liners are taken out and the compression volume is decreased to about 18.6 per cent of the total volume.

Austro-Daimler Engines

One of the first very successful European flying engines which was developed in Europe is the Austro-Daimler, which was built after the designs of Herr Porsche. The first of these motors had four cylinders, 120 by 140 mm., with cast iron cylinders, overhead valves operated by means of a single rocker arm, controlled by two cams, and the valves were closed by a single leaf spring which oscillates with the rocker arm. The cylinders are cast singly and have either copper or steel jackets applied to them. The four-cylinder design was afterwards expanded into the six-cylinder design, and still later a six-cylinder motor of 130 by 175 mm. was developed. The rights to construct this engine in Great Britain and the Colonies were secured by William Beardmore & Son, of Glasgow, Scotland. The engine is also being built by T. C. Pullinger and Arrol Johnston, of Dumfries, Scotland. This motor uses an offset crankshaft, as does the Benz motor, and the effect of offset will be discussed later on in this paper.

The lubrication also is different from any other aviation motor, since individual high pressure metering pumps are used to deliver fresh oil only to the bearings and cylinders, as was the custom in automobile practice some 10 years ago.

Two of the motors described, the Benz and Austro-Daimler motor, use the offset crankshaft construction, and this has for a long time been quite common in German and Belgian motor construction. Offsetting the crank has two effects, one to cut down the guide pressure of the piston and cylinder, and the other (which is purely a secondary effect) to lengthen the stroke of the piston, as the offset is increased with any given crankpin circle.

Sizes of Engines Required

It begins to be more and more apparent that engines of less than 200 hp. have only a limited field.

Even in the small, high speed scouting machines which fly from 125 to 140 m.p.h. it has been found necessary to use upwards of 300 hp. This does not mean that they actually have 300 hp. at the altitude at which they usually fly, but only a fraction of this, and the major problem which is at the present time confronting aviation motor designers is to compensate for the loss of charge weight at the higher altitudes. The enormous drop in temperature experienced when rising to heights of from 16,000 to 20,000 ft. also brings in serious carbureter difficulties, and it is almost impossible to simulate on a test block the conditions imposed on an aviation motor when in the air. As everyone knows the difficulties of operating a motor car in the winter, it will be readily appreciated that when a motor in the course of 10 min. operation has to pass through the whole range of temperatures experienced from summer to winter difficulties of no mean order will be encountered.

What we need immediately in America is a large number of training planes, but we also will have to have battle planes driven by motors that are not equal to but superior to those possessed by the enemy. The real danger, in my estimation, is that the evolution of our engineering will not be fast enough. We have not as yet enough clever minds engaged in these channels and we have not had stimulus for this sort of work. We have always had continually in the past that specter, cost, staring us in the face. A lieutenant in the British Flying Corps said one day last week that there was no question of price at all if a motor would deliver the goods. A very great deal has been done towards securing high horsepower weight efficiency by means of lightening the various parts of the motor structure, and I feel very certain that in a great many particulars this line of thought has reached its limit.

Amount of Mixture Important

The really important thing about aeronautic motors from now on is going to be the number of cubic feet of mixture per minute that a motor can handle, and in connection with four stroke cycle motors this points out the necessity of using relatively high speeds. The mean effective pressures arrived at in the Sunbeam motors are within 15 per cent of the theoretical maximums that are possible, and while there may be some improvement secured in the future in the matter of horsepower weight efficiency by means of further refinement in the mechanical construction, I believe that it is now necessary to ring in some changes upon the cycle of operation. This should be a splendid opportunity to try out super-compression and super-charging schemes of one sort or another, and possibly for those who have energy to try it, the two stroke engine, with its maze of new problems, stands as an opportunity.

Experience Cited in Discussion

In discussion Albert Schmidt, who saw service in the French air corps in the early part of the war, stated that too much attention used to be paid to lightness and too little to strength. J. E. Diamond said an American engine under development had run 5½ days of 8 hr. each, a total of 44 hr., with a much better gasoline consumption than the foreign engines mentioned in the paper, showing only 0.46 lb. per horsepower hour.

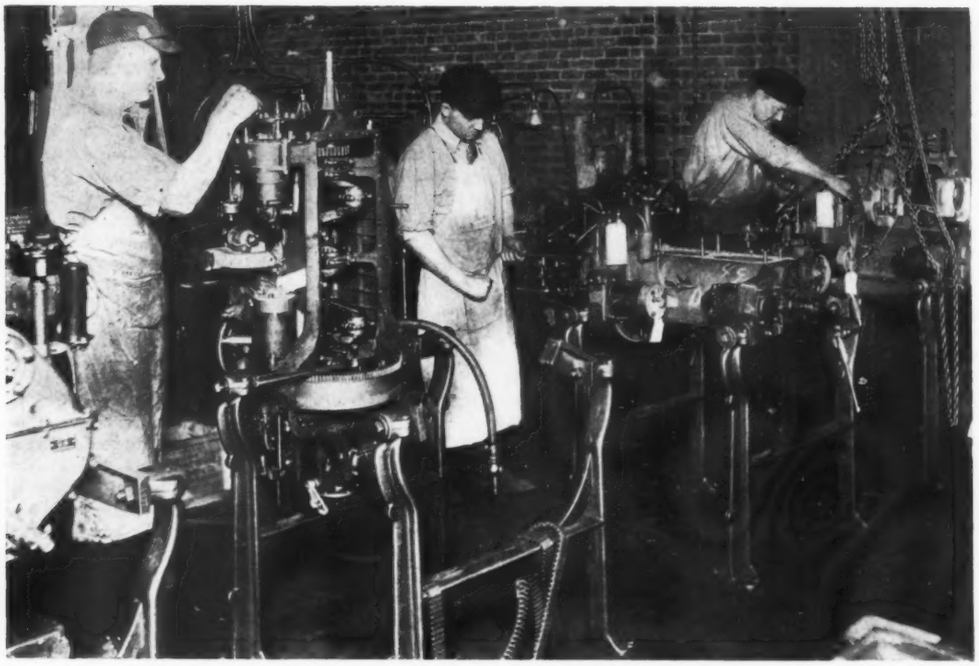


Fig. 1—Steps in the motor assembly, illustrating the individual stands upon which the engines are assembled

Movement Minimized *in* Building Hupmobile Engine

Part III

Crankcases Are Assembled First, Then Cylinders and Transmission—All Tested Before Final Assembly

By J. Edward Schipper

ASSEMBLY work on the Hupmobile engine is carried out on one floor. It is partially group assembly and partially progressive. The group assembly is performed on fixed-engine frames, and this may later be made progressive in case additional models are built. Other than the fixed-frame arrangement, the assembly work is progressive, with the parts being brought from machine to machine. The engine-assembling floor is above the manufacturing department, and, as will be remembered in the two previous articles, the finished parts in the manufacture leave the center of the room on the center aisle. This being the case, it is natural that the finished parts should strike the assembly floor in the same relative position, giving an opportunity to allow the parts to work both ways from the center for different types of work.

The assembly map will show that in the main the same fundamental scheme has been used in assembly as is used in manufacture; that is, having the cylinder and crankcase work on one side of the room and the small parts and test work on the other. There are minor exceptions to this, however, in that a number of the small parts are assembled close to the point at which they are needed on the cylinder and crankcase work, so that no time is lost by having to transport small parts a long distance to the points at which they are needed on the crankcase and cylinder assembly. The work in reality proceeds around the room, going, as the arrows show, down the left side of the assembly floor and back on the right, so that the final motor assembly work is finished at the back right-hand corner of the room, passing out to the block test. All this is clear by noting the direction of the arrows, which show how the steps in assembly succeed each other. All the castings are washed in Oakite solution before assembly, as shown in Fig. 5.

Taking the crankcase assembly, which is really the primary step in putting together an engine, the camshaft and main bearing bushing are the first to receive

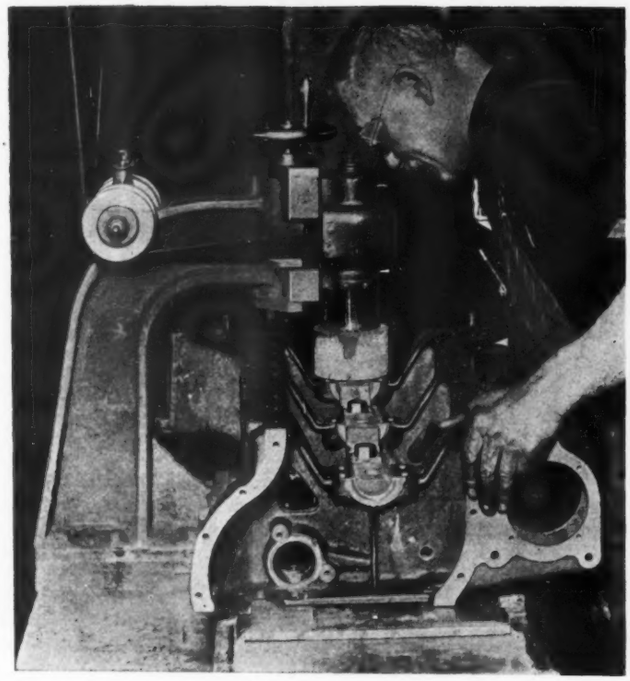


Fig. 2—Grinding top of lower bearing in crankcase

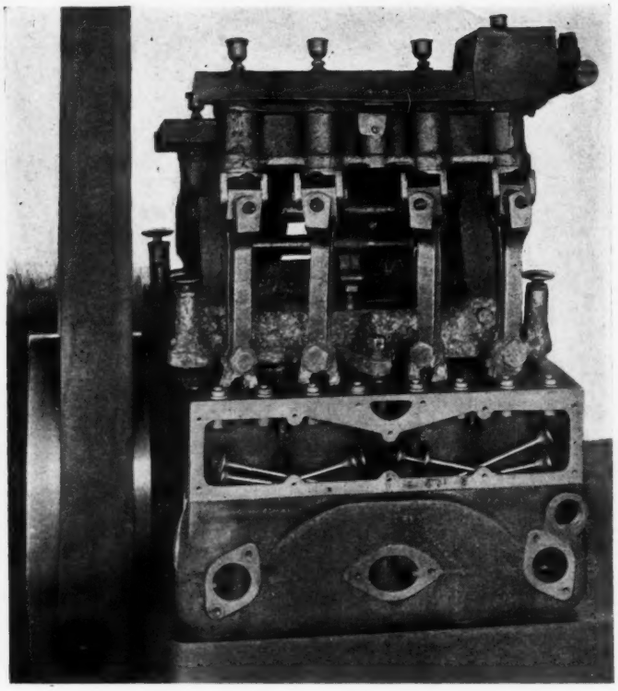
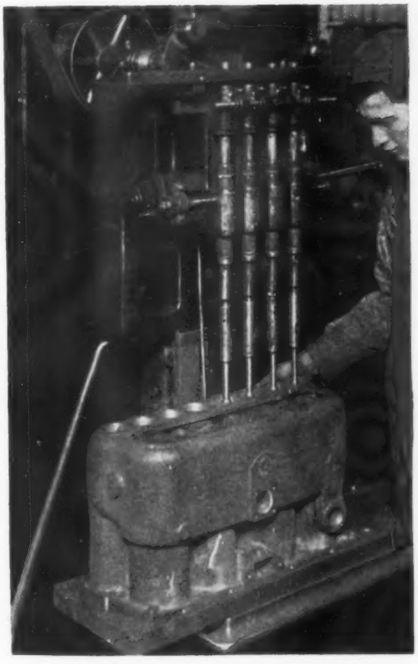
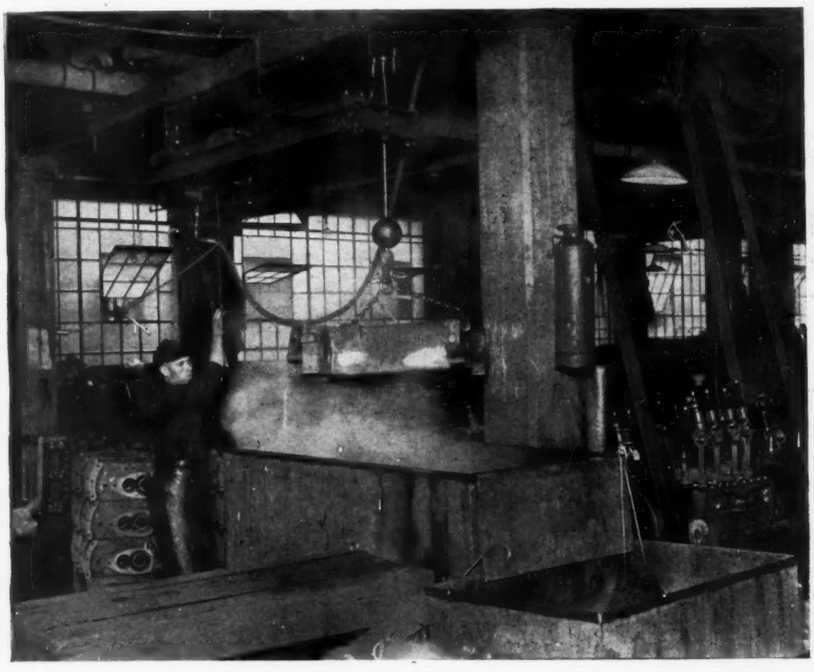


Fig. 3—Special machine lapping the pistons into the cylinders





Left—Fig. 4—Grinding valves on four-spindle machine with movable jig. Right—Fig. 5—Castings are washed in Oakite solution

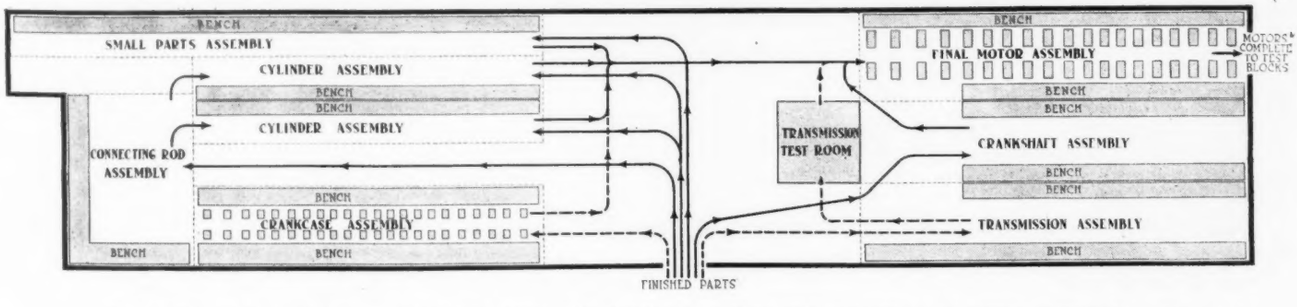
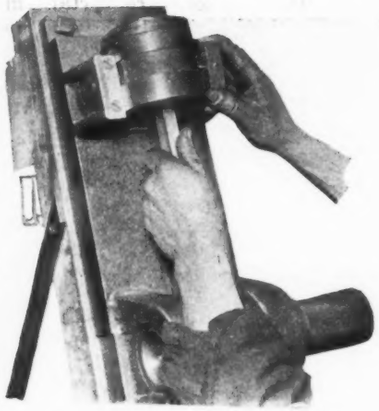


Fig. 6—Map of Hupmobile assembly room showing the location of various sub-assemblies and general progressive scheme



Above—Fig. 7—Lining up the piston and connecting-rod on a special jig to insure accuracy

Left—Fig. 8—Silence test for the transmission gears which all units must pass before final assembly

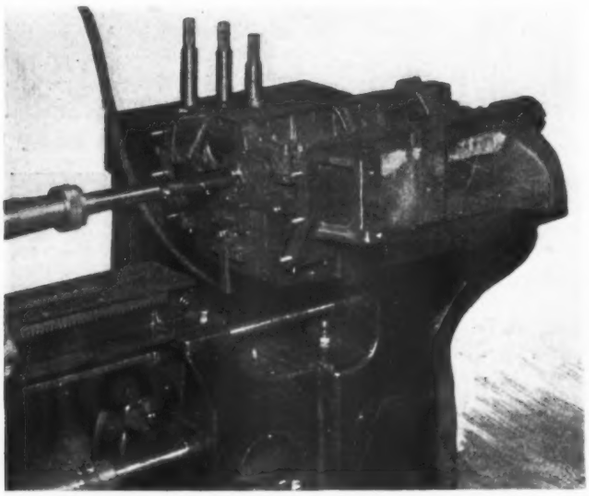


Fig. 9—Straight line reaming on crankshaft bearings

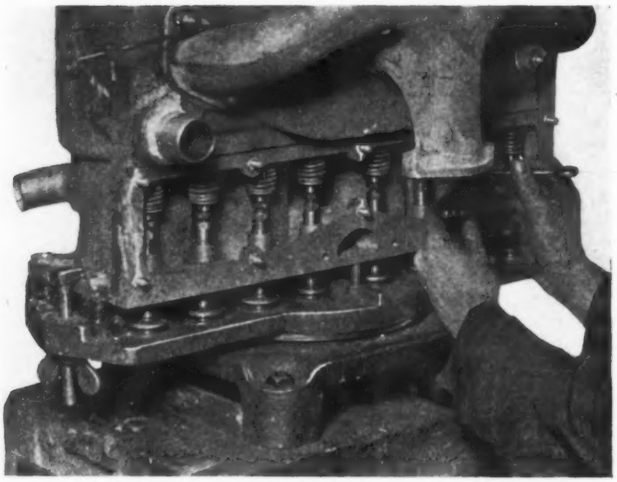


Fig. 10—Lashing valve tappets before the motor is assembled

Fig. 11—Finished motor receiving a silence test to indicate proper parts adjustment

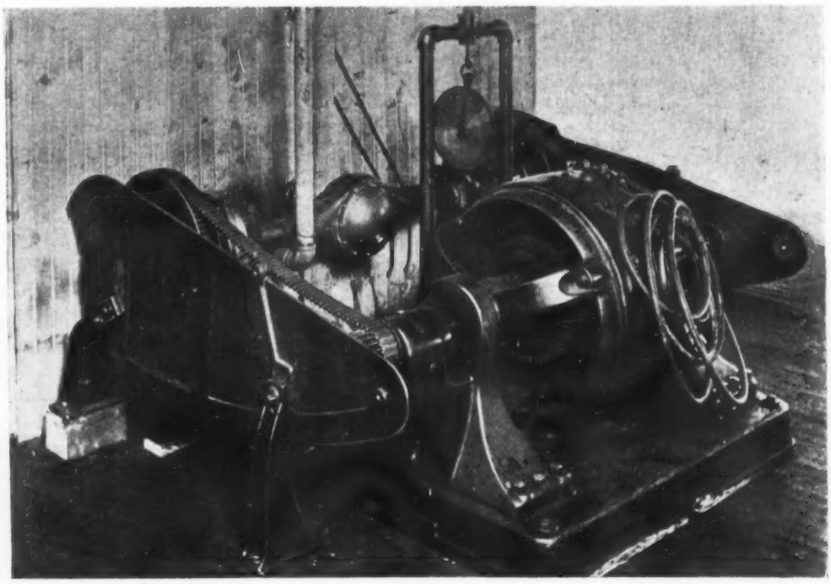


Fig. 12—The apparatus which is outside of the silence room, showing how the engine torque is delivered through drums corresponding to the rear wheels

attention. There are certain machine jobs to be done in connection with this work, one of the first being the grinding of the top of the lower bearings in the crankcase, giving an accurate square seating for the main bearing cap. The crankcase is inverted for this work, as is shown in Fig. 2. The flanges of the bearings and caps are ground flush, and the studs are put in with the caps fitted by hand. In fitting the main bearing caps, the proper clearance is allowed by using a plug gage at which the caps are fitted. These bearings are fitted 0.001 in. undersize, and after they are set up the main bearing boring operation of the crankcase takes place. This is a straight broaching operation and is shown in Fig. 9. This gives an accurate fitting to the bearing, but fine fitting is done by hand work by experienced bearing fitters.

Cylinder Assembly

On the cylinder, the first operation is to machine seat the valves, after which they are hand seated by a similar grinding-in operation. The tappet bushings are pressed in place and are then reamed. The pistons are fitted to the cylinders by means of a feeler gage, and are then lapped in by means of a piston lapping machine which is illustrated in Fig. 3.

Next in order of assembly are the valves and springs, the machine mechanical grinding of the valves being carried out on the machine illustrated in Fig. 4. The springs are assembled with the valves, and a number of minor assembly operations then take place, such as the water header, chamber plugs, tappets, etc., after which the cylinders are set on trucks and carried to an inspector's bench where the operations up to this point are checked. The cylinders are then mounted on blocks and both manifolds are fitted, as well as the carbureter, etc.

As will be remembered, the connecting-rods were finish-ground down in the manufacturing department, and the pistons are bought outside. The pistons and rods are assembled together in the connecting-rod assembling room, just adjacent to the crankcase and cylinder departments as indicated on the layout map. Each piston and rod assembly is weighed so that each one of a set of four for the four-cylinder engine is exactly alike. The

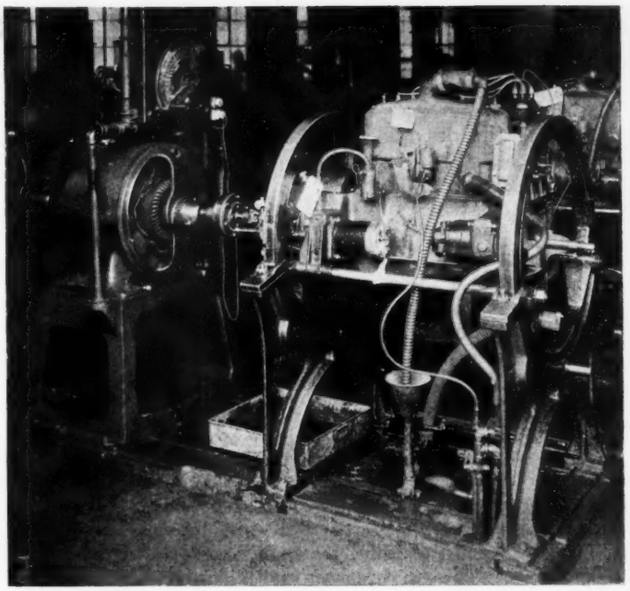


Fig. 13—Motor receiving a block test while mounted on a combination test and assembly stand

connecting-rods and pistons are then trued to a jig as shown in Fig. 7, so that the alignment will be accurate.

In another section of the floor the crankshaft assembly has been carried out, this consisting of fitting the gears accurately, and these are then carried on trucks over to the proper positions for the crankcase assembly and are put in the cases. The gearbox, together with the gears and clutch, are brought as an assembly over to the transmission assembly department, where the final transmission assembly takes place, as will be noted on the map; that is, the crankcases are first independently assembled, then the cylinders, then the transmission, and these three important units brought together with the line of motor stands indicated in the final motor assembly department. Each engine and transmission must be approved by test in a silence chamber before being passed to the final assembly. The silence chamber for the transmission gears is shown in Fig. 8, and after passing this test they are

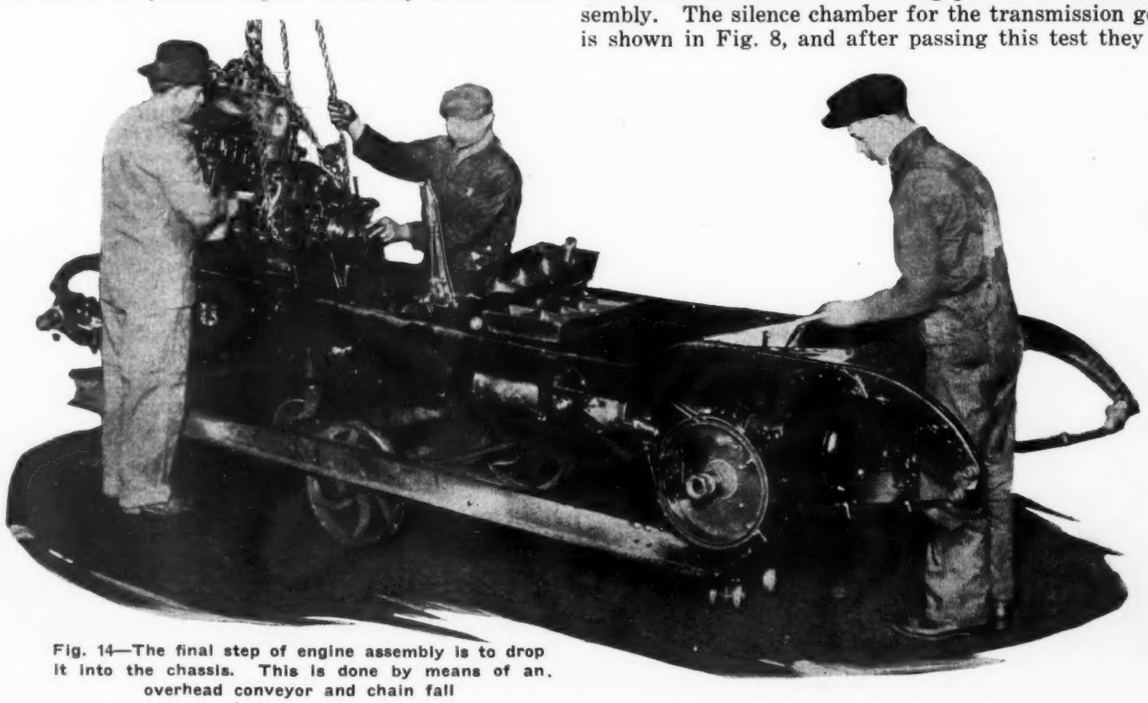


Fig. 14—The final step of engine assembly is to drop it into the chassis. This is done by means of an overhead conveyor and chain fall

immediately brought to the motor assembly racks where the usual motor assembly operations are carried out, some of which are shown herewith.

Fig. 10 depicts the lashing of the tappets, and Fig. 1 illustrates some of the early steps in engine assembly, indicating the flexibility of the assembly racks used for the purpose. Fig. 11 shows an engine undergoing the silence test after it has been completely assembled, while Fig. 12 shows the type of dynamometer used to absorb the engine torque during this silence test. It will be noted that the drive is through two drums which correspond to the wheels on the car, the engine itself being attached to a propeller shaft and drive through a set of differentials in the usual manner. The torque is noted upon a spring scale in the illustration just above the dynamo.

After this final assembly and test is completed, the engines are run in for a half hour by a belt drive, after which they are allowed to run about 8 hours under their own power before being torn down and entirely gone over and readjusted. In running the engines in under a belt they are rotated at a speed from 200 to 250 r.p.m., and while operating under their own power they start at 500 r.p.m. and gradually are increased in speed up to 1500 r.p.m. The engines on the block test are shown in Fig. 13.

After the block test is completed, the engines are ready to receive final O. K., after which they may be placed in the chassis, and the factory layout is such that these engines meet the chassis at the proper point so that they can be carried directly over the chassis assembly frame by an overhead conveyor, as shown in Fig. 14. This illustrates the engine being lowered onto the chassis frame by means of an overhead chain fall.

One of the ingenious features of the motor test is a combination rack used as a testing block and assembly rack.

Dayton Permanent Industrial Exhibition

WHAT is considered a step forward in the matter of methods of advertising or exhibiting goods is the recent opening of a permanent exhibition by the Greater Dayton Assn., Dayton, Ohio. The exhibition is located in the heart of the city and a comprehensive all-year-round advertising campaign is mapped out to sell the Dayton products on exhibition. Admission is free. There are 100 display spaces, varying in size and price. To encourage the use of live exhibits, those that can be demonstrated, electric power will be furnished without additional charge.

The association has leased the exposition floor for 10 years and the enterprise will be conducted without profit, except to exhibitors.

There is also a foreign trade bureau, a branch office of the United States Bureau of Foreign and Domestic Commerce, Washington. Manufacturers will be supplied with information as to specific openings for the sale of their goods in foreign countries. There will also be shown specifications, samples, exhibits, etc., of goods desired by foreign purchasers.

Two Ingenious Cooling Methods—One for Tractors

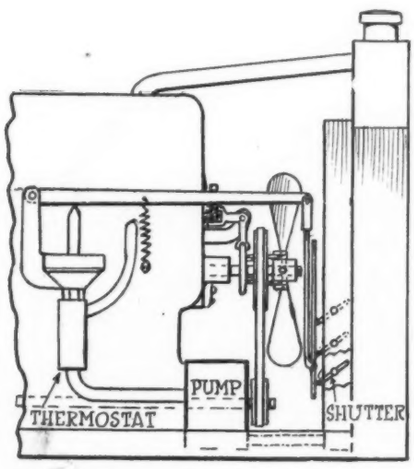
THE design of the cooling system which will maintain an engine at a nearly constant temperature is being very much considered at the present time. Recently several applications for patents have been made in this connection and two of the most interesting are described herewith.

The first inventor has two ideas. One of these is to operate shutters like those on the Hudson, either in front or behind the radiator, by means of a thermostat, and the other is to use a fan with movable blades something after the fashion of the reversible propeller employed on some small motor boats. He suggests that the pitch of the fan could easily be varied automatically by connection with the thermostat and that the amount of air which the fan would draw would, of course, be in proportion to the pitch.

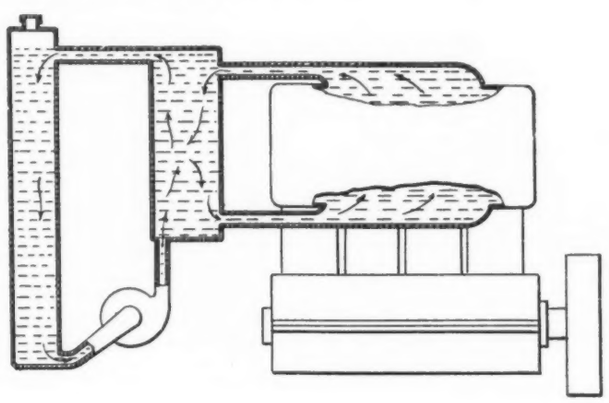
The patent covers the combination of these ideas and has been granted to J. N. Benjamin of the Hart-Parr Co., Charles City, Iowa. The inventor's opinion is that the fan idea would find its greatest scope on tractors where the speed of movement of the whole machine is so slow that it has practically no effect on the draft through the radiator. He points out also that it is not *necessary* to use a fan of variable pitch, since the same effect could be obtained by driving a conventional fan at variable speed.

The second patent granted to E. P. Colver, Schenectady, N. Y., is of a quite different nature and the main purpose is to provide means for maintaining thermosyphon circulation, which cannot fail through a fall in the water level. With the ordinary syphon system, if the outlet from cylinder to radiator is not covered by water there will be no circulation until the water in the jackets boils and throws over water into the radiator.

The illustration is a diagram of the simplest expression of the system. Between the cylinders and the radiator is a vertical tank through which the water coming from the cylinder head can by-pass and return to the cylinders again. The radiator and the intermediate tank also form a water circuit in which there is a pump constantly sucking from the radiator and delivering to the tank. The pump, it is pointed out, will keep the intermediate chamber always completely filled, which means that the outlet to the radiator will also be always full of water, and the cylinder water thus can always find a natural outlet to the radiator.



Left — Benjamin's thermostat control for radiator shutter and pitch of fan blades



Right — Colver's combined pump and syphon cooling system

Factors in Aviation Engine Design

Part II

Design Always a Matter of Compromise — Cylinder Arrangement Important—Weight Question Depends on Many Factors of Detail Construction—Number of Valves

By Louis Coatalen
Chief Engineer Sunbeam Motor Car Co., England

EDITOR'S NOTE—*Louis Coatalen is recognized as one of Europe's leading automotive engineers. Born and educated in France, he began his work there, joining Humber, Ltd., of Coventry, about 1905, and producing the first British car with any reasonable high gear performance. Since his association with the Sunbeam company this car has ranked with the best. His racing cars hold many records. The Sunbeam aviation engine has been the principal product of the factory since the second year of the war, and is reckoned among the best of the European airplane motors.*

WE might complete our survey of the inter-relationship of these three branches of motor engineering enterprise by adding that in the aircraft engine we have to economize weight considerably over the degree that will suffice for racing car practice, while economy of fuel and oil consumption is also more important in the case of the former than of the latter. Admittedly, in the racing car engine those two features constitute a special and important factor, but not one that has had to be studied yet on entirely different lines from standard car practice. Accordingly, perhaps we might conclude not unreasonably by stating in general terms that one stage in the development of the aircraft engine is represented by racing car enterprise as well as, perhaps, by certain sporting motor-boat engine work. Endeavors in these directions provided us with the data from which were designed the first engines evolved on lines to be of such efficiency as the present-day aircraft variety.

In face of our being now in the third year of war, and therefore for the most part somewhat out of practice in the matter of racing car engine design, whereas the leading firms in the industry in Europe have by now accumulated much experience of standardizing aircraft engines, though of recent years none of them has ever standardized any for racing service, it may be said that the data on which aircraft engines are being designed to-day are derived wholly from cumulative experience of aircraft engines, and have ceased to depend in any way on racing car experience.

Indeed, on the coming of peace, doubtless it will be found that the position has been wholly reversed from that which obtained before the war. In the future not a little of racing car engine design may derive from aircraft engine practice.

Desiderata in Aircraft Engine Design

To approach the problem from the correct point of view, we must recognize that the outstanding desiderata in designing aircraft engines to-day may be summarized thus:

a—Light weight, combined with low fuel and oil consumption, per horsepower.

b—Reliability.

If we can but attain those characteristics with units of not less than, say, 200 hp.—better still, if we can exploit them in units each up to 600 hp.—then we can afford more or less to neglect other desiderata as being of minor importance. Nevertheless, happily we can already go a far way toward realizing what we might style the minor desiderata, which at this period of the war include:

a—Simplification to the utmost in face of these engines being placed, for the most part, in the hands of a great number of men semi-skilled in even flying and maintaining them.

b—Foolproof as much as possible in that some of the most daring fliers have not either the temperament or the understanding to spare the engines of which they are put in charge.

c—Accessibility in face of the frequent attention needed by all aircraft engines and of the fortunes of war rendering it necessary on occasion to replace the most vital parts.

d—Standardization, because for the first time in the story of motor engineering we are making engines of high output in series in place of about a half-dozen examples at a time.

e—Suitability of exterior form that the power plant may be accommodated conveniently in the aircraft and occasion the minimum displacement.

Thus there are strict limits to the diametrical size of radial engines, whether of the rotary or of the stationary type, which it is profitable to employ for aircraft work; while in regard to the vertical, or to the V-type engines, the nature of the particular service to which each individual engine is to be put likewise imposes certain limits. In certain cases strict limits must be set to overall length of the engine, particularly at a time of war in the air, when, at need, it is essential to lose the minimum time in altering the flight path of the machine from a diving attitude to a very steep climbing one. Again, some sorts of aircraft call for the minimum engine head resistance, but are less imperative as to overall length; hence the six-cylinder type would be suitable for such service, whereas the V-type variety would not be.

Uniformity of Certain Characteristics

In other words, at this period it is impossible to lay down any arbitrary rules as to any one type of aircraft engine being suitable for the needs of all aircraft service. Those needs are almost as various as are the demands for special varieties of steel and of alloys. Moreover, they are likely to multiply with the lapse of time. Yet between the widest varieties we perceive the essential characteristics of demand to be uniform. This is a great gain alike to the designer and to the manufacturer on the one hand and to the Services on the other. It means that, when the right scheme of design is evolved, the least possible disturbance is caused in the given factory, though it be concerned with producing power plant of various size, weight, and horsepower output. Therefore the maximum production can be attained, while the problems of management and repair are correspondingly reduced to the minimum. Interchangeability can be exploited to the maximum, and, once the mechanics and pilots have mastered the principles of whatever system of construction is in question, it is found that those principles are applicable to all varieties of the given system of construction.

Demand in State of Flux

When we come to systems of construction, again there can be no laying down of hard-and-fast rules, for the sufficient reason that the suitability or otherwise of systems is predetermined by the demands of the aircraft constructor and the aircraft user, which demands are ever varying. Therefore what system may be the most suitable thing possible to attain satisfaction of the demand of to-day is not necessarily the principle on which to work for satisfying the demand of next year, or of five years hence. Thus, while we may make bold

to criticize the suitability of this system or that to satisfy the insistent demand of the hour, we must have a care not to be drawn into the making of sweeping assertions about the practicability of any system of construction for the necessarily nebulous needs of the future.

Probably it is little realized that if the aircraft engine designer had not to think of the means at present available to the manufacturer, nor of the time factor, nor of those to whose tender mercies the standardized product will be submitted, he would produce very different designs to fulfill any given purpose from those he evolves to-day.

Aircraft engine design resembles motor-car engine production in this particular, that it is all the time a question of compromise. The most successful designer is he who exercises the soundest judgment in weighing a hundred and one factors of the hour and who gives the shrewdest estimate of the relative value of each.

Having thus striven to give a notion of what one might style the psychology of aircraft engine designing at this or any period, let us take some of the governing factors of to-day somewhat more in detail. It is not deemed desirable, therefore it is not proposed, to give in a paper of this sort particulars of any engines such as are being or are about to be used by the Services in this war. Instead, it is held to be preferable to review with more or less detail the points that have received most attention in the development of the design of the latter-day aircraft engine.

Three Main Schemes

In regard to the general arrangement of aircraft engines, there are several main types, each of which involves advantages as well as disadvantages. The business of the designer is to effect the best compromise possible to fulfill the particular class of service that is had in mind in scheming the individual engine.

Of course, multi-cylinders are common to all types of aircraft engines. But the arrangement of the cylinder groupings and settings differs entirely as between one type and another. Doubtless the most generally favored form is the V type with either twelve or eight cylinders per unit, these being set in two rows on a common crankcase whereby one crankshaft suffices because one crankpin serves for each pair of opposed cylinders.

Undoubtedly next in order of importance is the radial type, in which the cylinders are set in one or more planes with axes radiating from the centre line of the crankshaft.

The two sub-divisions of the radial type of engine are the rotating and the fixed variety.

What we may style the straight-line engine constitutes the third main type. In this four, more generally six, and, in a few examples, even eight cylinders, and twelve, are placed in a line and are set vertically on a crankcase, the pistons and connecting-rods acting on a crankshaft with one crankpin per cylinder in the orthodox fashion of automobile engine practice.

Each Suitable for Particular Form of Aircraft

Inasmuch as each of these three types has advantages peculiar to itself, it follows that each is the most suitable so far available for some particular form of aircraft. For instance, the cross-section or wind resistance area per horsepower is least in the straight-line engine and most in the rotating radial type. This includes the loss of power necessary to rotate the engine. The fore and aft length of the engine, however, which is of great importance in some aircraft, is least per horsepower in the case of the rotating radial type and greatest in the straight-line engine. Moreover, when the straight-line engine is water-cooled, as is generally the case, the rotating radial type gains a further advantage on the score of decreased weight per horsepower. Against this, however, the economy of fuel and oil consumption which can be obtained with the straight-line water-cooled engine is appreciably greater than is possible with the rotating air-cooled type as designed to-day.

Somewhere between the two contrasted types of engines as regards the problems of wind resistance and overall length is what is styled the V type of motor, wherein weight per horsepower is lighter than in the straightline engine, owing, of course, to the proportionately much greater crankshaft size in relation to the number of cylinders employed. But if we consider the case of the air-cooled V-type engine, under the score of weight per horsepower, of course, it has to yield place to the rotating radial type.

Yet another type which I have produced and standardized during the past year with highly satisfactory results is a development of the V form of engine in which more than two rows of cylinders are placed on a common crankcase. The particular engine had in mind employs three rows, each of six-cylinders, on a common crankcase, each crankpin being connected to three pistons by articulated rods. In this eighteen-cylinder unit the centre lines of the cylinder make, in relation each to the other, an angle of 40 deg. This allows of a very good firing diagram. This type of engine is one that is considered very promising for units of very large power. As regards weight per horsepower, it has advantages over both the V and the straight-line types of engines.

A further development of this design, in which the rows of cylinders are increased, brings us to the consideration of the fixed radial engine, which, in my mind, is one that has been sadly neglected. I feel that we shall hear a deal more about it in the near future. Several forms of these engines have been designed and made, but it may be said, in broad terms, that the success of them does not yet appear to be as great as we should be led to anticipate from consideration of the possibilities of this particular form of design.

The question of head resistance might be raised in regard to this engine, in that, when many cylinders are used, the diameter of the projected area of the power plant is increased.

Suitability of Fuselage Section

In the case of most single-engined aeroplanes or seaplanes a fuselage of circular cross-section is admirable. It can be made large enough to accommodate the fixed radial type engine without increasing unduly the head resistance of the machine.

This is not so, however, in the case of multi-engined aircraft, in which the power plant units are placed away from the body of the machine. In these cases increase of head resistance above the minimum necessary for each power unit is the greatest disadvantage; therefore its avoidance is of vital importance. Hence for multi-cylinder aircraft the straight-line type of engine is the more suitable, particularly as the power per unit at present demanded by the builders of these machines is well within the compass of types that have been produced on the principle wherein the cylinders employed are set in a single row vertically on the crankcase.

In the circumstances in which we meet in mid-campaign it is not possible to discuss definitely the size of engine which is most likely to be adopted as standard in the near future.

A particular effect of the war on the evolution of aviation is the rapidity of the advance which has been and which continues to be made in the design and production both of aircraft and of engines for them. Compared with the average of enterprise in normal times, the amount of experiment that has been carried out in these directions during the last year or two is amazing, and the practical results obtained are correspondingly important. In the Sunbeam factory experimental work is held to be of vital importance, in that the discovery of anything that gives advantage over any feature of previous practice is essential for the improvement of the product standardized. Doubtless this accounts for the rapidity with which changes are made in details of design, also for the fact that the whole question of design is vastly more in a state of flux than the lay mind imagines.

Further, the experience gained by our aviators since the beginning of the war, together with the demand for the engineer to meet their ever-growing needs, has called for continuous evolution in the design of aircraft, all of which has inspired corresponding enterprise in regard to engine construction and production.

The Problem of Weight

With regard to the question of weight, the purpose for which the particular aircraft is required is of prime importance. Obviously, in the case of the engine in a machine designed for short flights only, the consumption of fuel and of lubricant is of less importance than the weight of the engine itself, whereas in the case of the heavier sorts of aircraft

with which flights of long duration are obtained and for which great power per engine is needed, the consumption assumes much more importance than the actual weight of the engine. In these latter cases efficiency as regards the weight of the power unit has to be arrived at by taking the weight of the engine complete with the amount of fuel and oil that would be consumed in the course of a flight of, say, five or six hours' duration. Thus for short flights the rotary type of engine generally and the air-cooled varieties are apt to show up to advantage, though in them consumption may be comparatively high, because this is offset by the relative lightness of their starting weight.

From several papers that have been read recently with reference to aircraft engines it is evident that, speaking broadly, as regards weight per horsepower, progress in the design of the ordinary water-cooled type is very marked. To my knowledge, in the brief period of 2 years there has been obtained with this type a reduction in weight from 4.3 lb. per horsepower to 2.6 lb.

It follows that in designing aircraft engines a variety of points have to be considered with extreme care concerning which the builder of an engine for ordinary car service is not forced to take much trouble. This difference is rendered necessary, firstly, by reason of the amount of material employed, and secondly, on account of the comparatively light weight of the aircraft engine complete.

Valve Design: The Intermediate Stage

The design of the engine head, the cylinders, the valves, and the valve gear is one of the cardinal features of successful aircraft engine production. Car engine design allows of the employment of the L-shaped head, or, in some cases, even of the T-shaped type, though the latter is not used to any great extent to-day for automobile vehicle practice. Undoubtedly the L-shaped head has given excellent results in aircraft engine practice in the past, but I prefer to consider that such examples really represent an intermediate stage in evolution and that they stand rather for modified or adapted car engine design than for aircraft engine design proper. In point of fact, high efficiency is got with this type of head only by the use of a special design of valve cap that makes provision for the maximum surface of the engine head being served with water by the cooling system. In other words, you employ a form of duplicated valve cap, the removal of the upper and outer member of which reveals a space for water to circulate beneath it when the engine is working. At the bottom of that water is the valve cap proper. Further, to get the best results, it is needful to machine as much of the surface of this transition type of engine as possible.

The Number of Valves per Cylinder

For standard car work one exhaust and one inlet valve per cylinder have sufficed for general practice to date, whereas present-day demands on aircraft engine designers are so great that any attempt to attain the requisite degree of efficiency by further exploiting such a scheme of design would lead inevitably to failure. The necessity for running aircraft engines for long spells at either the maximum or a very high output without impairing the efficiency of the machine by distortion or pitting of the valves, which assuredly would occur with the ordinary design employed for car service, and so forth, has compelled the devotion of much thought and a wealth of experiment to the problem, as a result of which it appears to be accepted as established that the multiple valve system is a necessity.

In this connection, to achieve maximum output, I favor two exhaust valves per cylinder and two inlets.

The power obtained by engines designed on this principle and now standardized would appear to justify this conclusion. For example, a six-cylinder engine embodying this feature of valve design and having a cylinder bore of 3 3/16 in. with a piston travel of 6⅛ in. develops 153 hp. at 3000 r.p.m. That is equivalent to a mean effective pressure of 134 lb. per square inch. At 2000 revolutions it represents a duty of 21 hp. per 62 cu. in. piston displacement.

Among the advantages of the four valves per cylinder scheme are that a good shape of engine head is obtainable with it as well as the best sparking plug position, because that is vertically in the center of the head. The inclination of the valves necessary for putting them into place allows of ample water-jacket space being provided around each valve and at the base of the sparking plug.

Judged by achievement to date, any other combination of valves per cylinder will not give quite the same degree of efficiency. Take such variants as three valves per cylinder on the principle of two exhaust and one inlet valve. While giving perhaps a better-shaped, because circular, head that can be machined practically all over, this combination practically precludes any other sparking plug position than in the side of the barrel. For obvious reasons, such an arrangement has many disadvantages. Nevertheless, the three valves per cylinder scheme gives quite notably good results when exploited in certain ways and for certain special purposes. This may be judged from the fact that the diameter of the inlet valve can be made large enough to-day to give a very high power per cubic inch without involving serious trouble, such as would arise from heat effects, and so forth.

The use of more than four valves per cylinder is undesirable. It seems hardly possible to place them efficiently, leaving an even jacket all round each valve, without the employment of very complicated gear. We have an example of this in the Maybach engine, which has three exhaust and two inlet valves per cylinder. In this scheme little water space is provided between the valve seats, while the sparking plug is, besides, set horizontally in the side of the cylinder barrel.

Undoubtedly in any type of engine it is a gain when the surface of cylinder head can be machined. This is not possible, however, with the four valves per cylinder design. Hence in that case a compromise is achieved by making the surface as small as possible and by finishing it as much as possible by hand with files, scrapers, and so on.

The Matter of Material

In regard to the material of which the cylinders are fashioned, a tribute is due to the metallurgists and manufacturers on account of the great improvement in the cast iron available for cylinders of recent years, the very high tensile and good ductility qualities of it being particularly notable.

Of course, the advent of aluminum alloy as a material for cylinder castings marks an important stage in the advance of aircraft engine design and production, the rate of progress obtainable by the designer being determined primarily and always by the materials that are available to him. A series of experiments carried out by me over a period of more than twelve months has proved the superiority of aluminum alloy for this work. It has established the fact that it can give completely satisfactory results when the precisely right alloy is handled with knowledge and is employed on tested designs. Thus a 12-cylinder aircraft engine of 3⅛ by 5 5/16 in. has run at full power for 100 hours without an involuntary stop or untoward incident.

With that sort of confidence which is founded on reason, as the result of cumulative experience on the one hand and further research on the other, particularly with a view to rendering these special alloys capable of being cast easily in the factory, we may look for both speedy and consistent improvement in those varieties that will be available for this highly specialized work. Though we are merely on the threshold of realizing the possibilities of aluminum alloys for cylinder castings, it cannot be doubted that within a brief period they will be recognized as the standard materials for this work, cast iron being discarded in favor of them.

Progress in Castings and Alloys

The importance of the matter is realized by the aluminum founders of the country. It is encouraging to note the relatively great amount of enterprise being displayed by them in this connection. At the present time the more important aspects of the case embrace the effect of heat on the strength of the given alloy as well as the coefficient of expansion of it. In the manufacture of aircraft engines more and more use is being made of aluminum alloys of varied analyses, each to suit some particular condition of work. With a continuance of advance in knowledge of heat treatment, and so forth, there is no gainsaying that this material will be employed for aircraft engine construction to a greater and yet more great extent.

(*To be continued*)

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SIDE GUIDE & GRIPPER

Republic Clubhouse a Good-Will Asset

Is Chief Factor in Keeping Labor Turnover 10% Under Average in Akron Tire Factories

By Allen Sinsheimer

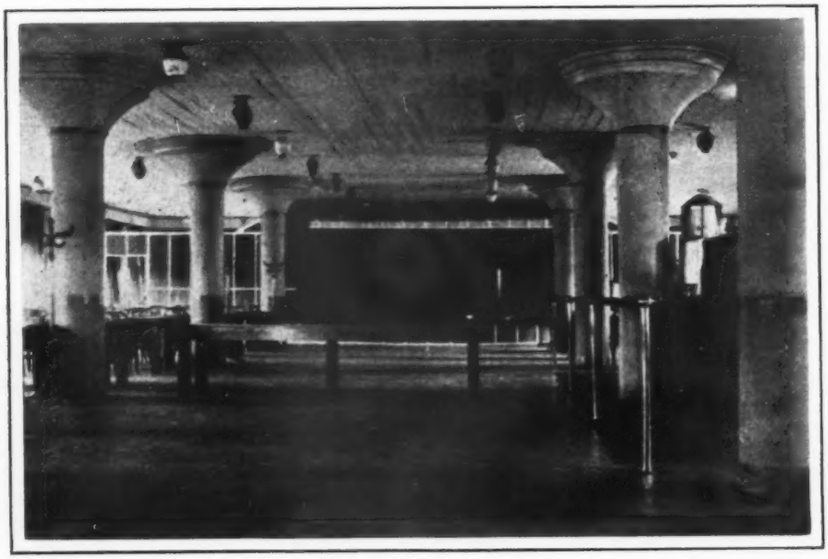
Republic Rubber Co. clubhouse. It is 75 by 250 ft.

EDITOR'S NOTE—This is the seventh of a series of articles by Mr. Sinsheimer based on an intimate study of the industrial relations work being carried on by our manufacturers. Better home and working conditions are two features that are emphasized.

THE problem of keeping its labor turnover small has been solved by the Republic Rubber Co. through the medium of its clubhouse. The wandering tendencies of the average rubber worker have been checked through such benefits as good food at reasonable prices, a convenient restaurant, educational facilities, and good-fellowship between the workers. The labor turnover, as a result, has been lowered 10 per cent under the average at Akron. The company has a monthly turnover of 240 men less than the average rubber company. Computing the cost of turnover at a minimum of $60 per worker and a maximum of $90 per worker, the company saves at least $172,800 a year.

The Republic clubhouse, erected in the first months of 1914, is a two-story structure, 75 ft. wide and 250 ft. long. It is located directly across the street from the administrative office building and the main factory entrance, and is quickly accessible to the workers as they leave the plant.

The basement, which is reached by a stairway connecting directly with the main entrance, contains bowling alleys, pool tables and a cigar and confectionery counter. The first floor includes the office, a large restaurant for girls, an auxiliary kitchen which operates in conjunction with the main kitchen, a stage for lectures and entertainment, a library and a rest room. On the second floor are the main kitchen, a large restaurant for factory workers, a private dining room for the company officials and a commissary department.



Second floor dining room, showing the stage and platform which is used for entertainment or lecture purposes

The cost for erecting and equipping the clubhouse was:

Building, property and equipment, including lighting fixtures, stage, office furniture and restaurant tables and chairs, etc.	$40,389.88
Kitchen equipment of ovens, urns, etc., with a capacity for 1000 meals daily	3,933.71
Bowling alleys (6), pool tables (4), and the cigar and confectionery counter	4,274.43
Total	$48,598.92

Maintenance of the institution is provided by the income from the restaurants, cigar and confectionery sales, pool tables and bowling alleys, plus appropriations from the company's treasury. A membership fee of $1 per year was demanded from the workers during the first 12 months of the club's existence, but this plan was given up when it was found impossible to refuse admission to those workers who paid no dues and to request

everyone to display his membership card every time he entered the clubhouse. Consequently, all membership fees have been eliminated and every employee is counted a member of the club without payment of any kind.

There are 2400 Republic employees, purchasing an average of 800 meals daily. The dining rooms, lecture room, bowling alleys and pool tables have been found ample for this organization.

The clubhouse has not proved a success financially. The revenue derived from meals, pool tables, bowling alleys, cigars and candy, and the disbursements for supplies, wages and other operating expenses, are as follows:

AVERAGE DAILY ACCOUNT

Restaurant	Debit	Credit
175 lb. meat, average 20 cents per lb	$35.00	.....
5 bu. potatoes, $3.70 per bu	18.50	.....
125 loaves of bread (home baked), 10 cents a loaf	12.50	.....
95 pies, 15 cents each (home baked)	14.50	.....
40 gal. milk, 26 cents a gal	10.40	.....
65 gal. coffee (2 lb. to a gal), 27 cents per lb	6.80	.....
30 doz. eggs, 37½ cents a doz	11.25	.....
19 lb. butter, 42 cents a lb	7.98	.....
Spices, greens, etc	7.10	.....
Linens, paper napkins, etc	2.00	.....
Bowling		
Pin boys, 4 cents a game—70 games daily average	2.80	.....
Pool—Wear and tear, 10 cents per hr. of play—15 hrs. daily	1.50	.....
Cigars and candy daily requisition amounting to	7.15	.....
Wages		
Manager	5.85	.....
Chef	5.00	.....
7 kitchen assistants	11.65	.....
Waitresses (factory girls paid 40 cents per hr.), 36 hrs. daily	14.40	.....
Manager pool, bowling, cigars and confectionery	2.50	.....
Assistant to general manager	12.00	.....
Janitors and other housemen	40.00	.....
Ice	.35	.....
Gas	2.85	.....
Electricity (cooking and light)	3.00	.....
Heat (all-year average)	1.00	.....
Total	$236.08	.....
800 meals served daily, average 20 cents		$160.00
Cigars and candy		10.20
Bowling (10 cents a game), average 70 games		7.00
Pool (30 cents an hr.), average 15 hrs. daily		4.50
Discounts on bills—daily average		.55
Total		$181.25

Total daily loss—charged to profit and loss, $54.13.

These figures show that, excluding the general cost of operation, the restaurant loses at the rate of 2 cents per meal, or $16 daily; the pool, bowling, cigars and confectionery earn a profit of $14.90—almost sufficient to offset the restaurant loss. The profit on cigars and candy is based upon a 30 per cent margin. The chief loss is sustained in the general operative expense. The total yearly cost, therefore, of maintaining the clubhouse amounts to $17,748.95, since the daily average is based on a 6-day week.

This result, without further investigation, would reveal the clubhouse as a costly venture, and the average employer might consider it more of a liability than an asset. This view,

Main kitchen of the Republic clubhouse, where 2800 meals are prepared daily

however, would be erroneous. There are undoubtedly numerous benefits resulting from its maintenance, and it is even possible to compute a profit in dollars and cents, when the labor and employment problems are considered. The Republic Rubber Co. is the only large rubber manufacturing concern in Youngstown, Ohio. It seeks its workers either at Akron, the heart of the rubber industry, or recruits them from the steel plants in nearby cities. Rubber workers are notorious for their wandering tendencies. They habitually change positions and employers, and by their constant migration have forced the Akron companies to inaugurate the gigantic systems for the improvement of industrial relations which have previously been discussed in these columns. Consequently, the Republic company has found itself at a serious disadvantage; it has encountered even greater labor problems than exist in Akron. Yet it has now a labor turnover that is 10 per cent lower than the average at Akron, and its labor superintendent attributes this percentage to the Republic clubhouse.

"When I go to other cities for workers or seek them in the nearby steel mills," he stated, "the first question they ask is: 'Can I secure a room and where will I eat my meals?' And since there are no restaurants within several miles of our plant it is only through the clubhouse dining room that I am able to secure and hold the men.

"They enjoy the good food we serve and appreciate the low prices at which they can purchase it."

The company employs 2400 men and has a monthly turn-

Largest dining room in Republic clubhouse. It has seating and serving accommodations for 350 people

over of 240 men less than the average rubber company. This makes a yearly total of 2880 less. Since the various companies compute the cost of turnover at a minimum of $60 per worker and a maximum of $90, the company effects a saving of at least $172,800 gross, which may be directly attributed to the clubhouse.

Makes for Harmony

In addition, there are the other benefits of harmony and friendliness between the workers, the library advantages which extend education, the lecture room meetings where the industrial relations between employee and employer are improved, and the convenient location of the restaurant allows the workers to secure good food quickly and thus prevents loss of time. The company also has its private dining room where dealers from other cities can be fed and entertained conveniently and at little cost.

The attitude of the officials can be understood by the instructions given recently to the new superintendent of the clubhouse, who was told by Thomas L. Robinson, president of the company: "We do not want to make a profit from the clubhouse. It could easily be made to pay for itself if meals were based upon a 30-cent average. But the clubhouse pays in other ways and we want to continue upon the present basis, improving only in the service we give to the workers."

The manufacturer who desires to erect a clubhouse for his workers may be guided within reasonable bounds by the results gained by the Republic company. Of course, he may be inclined to construct a more elaborate clubhouse, similar to the $150,000 structure recently built by the Reo Motor Car Co. or the $350,000 building erected by the Firestone Tire & Rubber Co., both of which were described in THE AUTOMOBILE. The cost of the ground, equipment and building can be set at any figure desired. But the operating expense of the Republic clubhouse can be copied and an estimate made for larger groups of workers on a basis of 30 per cent additional expense if for an organization of 5000, 50 per cent additional for 7500, and 100 per cent additional for 12,000 workers. These figures are based upon the experiences of concerns operating clubhouses in industries other than the automobile or parts business and upon the Republic results.

Plans Easily Available

Blueprint plans for clubhouses will be provided free of charge and submitted in various arrangements by companies which specialize in the equipment of these dining rooms. Several of these companies equip the complete clubhouse, including billiard halls, card rooms, kitchens, restaurants and rest rooms, and will also submit bids for completely furnishing the buildings, thus allowing the employer who knows the cost of his building and property to determine easily the exact cost of erecting and equipping the clubhouse.

Manufacturers' Merchandising

Firestone's "Milestones"

A NEW idea for reaching the owner is incorporated in *Milestones*, an attractive monthly magazine for the automobile owner and also the advertisement of Firestone tires. The magazine is published with the intention of reaching the automobile owner in the most pleasing manner. The June issue has sixteen pages of reading matter, with only three pages of advertising, and no publicity stories.

The magazine is intended to draw the attention of the owner and not to be thrown in the waste-paper basket, as so often happens with letters from the factory or dealer to the owner. Most house organs, though interesting at the start, usually end up with a boost for their specific product. Unlike these, *Milestones* is of interest throughout, with fiction by men of national reputation, such as Ring W. Lardner, Harold Titus and Henry G. Woodhouse, the last being governor of the Aero Club of America. Only the inside front and back covers are devoted to advertising Firestone products, and the outside back cover carries the advertisement of some local dealer, who is charged 3 cents apiece for the paper. The advantage of such a periodical is that it gives the dealer an opportunity to get his own advertisement directly before the people he desires to reach.

Hyatt Roller on 12,000-Mile Trip

THE Buick, now known as the Hyatt Roller and which has traveled 261,800 miles since it was made in 1909, has started on a 12,000-mile jaunt that will carry it across the continent and back. The car was officially started on its long journey by Mayor Marx of Detroit, who sent greetings from the automobile center of the world to the mayors of 297 cities and towns in the United States which the car will visit.

The car is owned by F. E. Slason of Plainville, Kansas, who was the winner in a mileage contest conducted by the Hyatt Roller Bearing Co. in 1915, when prizes were offered to automobilists whose cars had traveled the greatest distances on a single set of Hyatt bearings.

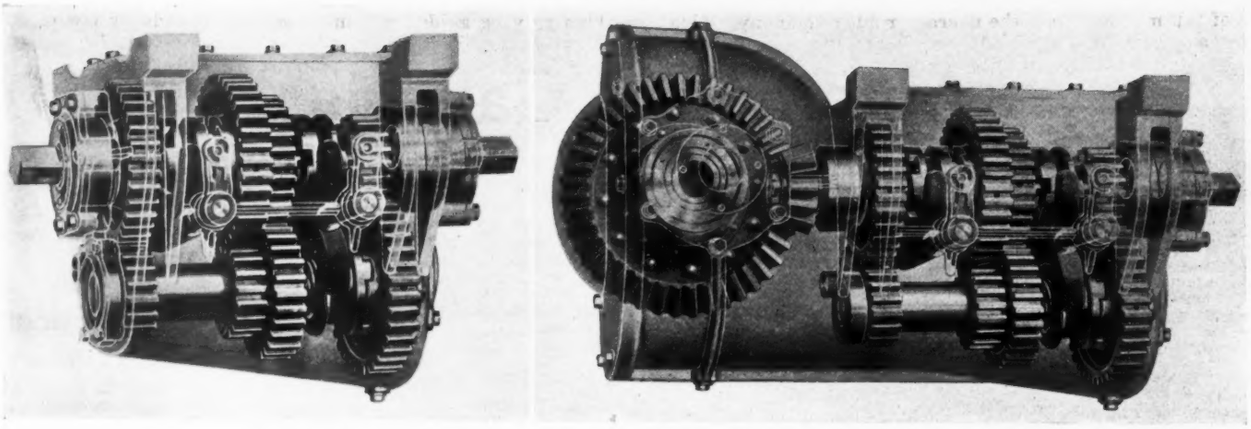
The first lap of the tour, Detroit to New York City, has just been completed, and the car is now on its way across the continent to Los Angeles, from which point it will travel north to San Francisco and Seattle and back by a northern route to its starting point.

The car has been used as a racing, demonstrating and trouble car, and for hauling, touring, trucking and livery. It has worn out over 300 tires, valued at $8,000, and has often carried loads as high as 1800 lb. of pianos, trunks and other baggage. The car has a straight track record of 70 m.p.h. The original set of Hyatt bearings, installed when the car was built, is still doing duty.

Utilizing Scrap Fabric

GOOD vulcanizing cement may be made from scraps of repair fabric. The clippings should be kept free from dirt, and when several pounds have accumulated, the friction should be dissolved in high-test gasoline. Scraps should be run through a wringer to extract all the friction.—D. R. CAIN, Instructor, School of Tire Repairing, Goodyear Tire & Rubber Co.

The 1909 Buick which has traveled 261,800 miles. It is called the Hyatt-Roller and is now on a 12,000-mile trip across the Continent and back. The vehicle has had a variety of experiences as a racing, demonstrating and trouble car



Left—Cotta gearbox adapted for sub-frame mounting. Right—Model for chain drive

Cotta Gearboxes in Five Sizes

FIVE sizes of gearbox comprise the line of the Cotta Transmission Co., Rockford, Ill. These are adaptable to the unit power plant, the amidship shaft drive, or chain drive, and the housings and mountings are arranged to suit any of these three conditions.

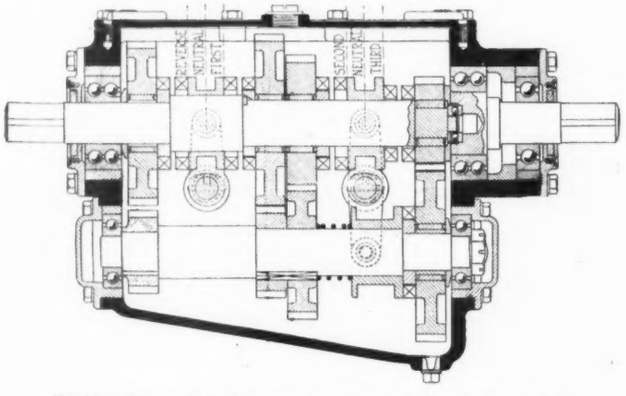
The feature claimed by the Cotta Transmission Co. for its units is an elimination of gear clash because of the fact that the gears are always in mesh. The speed changes are obtained by the use of jaw clutches, by means of which any of the gears may be locked to the shaft. Another feature of the gearbox is that on direct or high speed the countershaft and mainshaft do not rotate, as the members of the mainshaft are locked together, while the mainshaft revolves inside the gears on roller bearings. Immediately, when any other speed is used, the countershaft is automatically engaged and the desired speed picked up by the sliding clutches.

These gearboxes are particularly adapted for trucks, and the accompanying sectional views show the sub-frame type of transmission. These are capable of handling any capacity from 1 to 10 tons, the gear face being 1 to 2 in. in width. These gearboxes can also be supplied in unit power plant types in three sizes, having 1-in., 1⅛-in., and 1¼-in. face gears. When furnished as a unit power plant the Borg & Beck clutch and control set is included.

All five sizes of gears are included in the sub-frame type of gearbox, which is particularly adaptable for amidship mounting. All five sizes are also furnished on the chain drive assembly, in which case the gearbox also includes the bevel drive unit and differential.

As regards bearing equipment, the Cotta company furnishes S.K.F., Bower, New Departure, or Timken. The necessary specifications of all these models is shown in the accompanying tables, along with the various gear ratios. The tooth pressure angle on all these gear sets is 20 deg. The action of the gearbox may be readily understood from the fact that instead of the changes being made by sliding the gears they are made by locking the gears on the shaft by means of jaw clutches. On the face of each of the speed change gears, which are mounted on roller bearings, is a set of jaw clutches. On the driven shafts are two corresponding double sliding clutches, by means of which any of the speed change gears may be locked to the shaft regardless of car speed.

The shifting forks are simple parts of steel, hardened and ground, with a locking device provided on the forks, so that it is impossible to engage two speeds at the same time. The tabulation of specifications is as follows:



Section through Cotta gearbox for sub-frame mounting

Specifications of Cotta Transmission for Sub-frame Mounting

Model	Truck Capacity		Gears		Gear Ratio			
Shaft Drive	H.P.	Tons	Face	Pitch	1st Speed	2nd Speed	3rd Speed	Reverse
B A	25– 35	½ to 1½	1 in.	6–8	4 to 1	2 to 1	1 to 1	4.125 to 1
C A	35– 45	1 to 2½	1⅛ in.	5½ to 7½	4 to 1	2 to 1	1 to 1	4.125 to 1
D A	45– 60	2½ to 4	1¼ in.	5–7	4 to 1	2 to 1	1 to 1	4.125 to 1
E A	55– 80	4 to 6	1½ in.	4½ to 6	4 to 1	2 to 1	1 to 1	4.125 to 1
F A	80–150	6 to 10	2 in.	4–5	4 to 1	2 to 1	1 to 1	4.125 to 1

Specifications of Cotta Transmission for Unit Power Plant

Model	Truck Capacity		Gears		Gear Ratios			
U. P. P.	H.P.	Tons	Face	Pitch	1st Speed	2nd Speed	3rd Speed or Direct	Reverse
B U A or B U	25–35	½ to 1½	1 in.	6–8	4 to 1	2 to 1	1 to 1	4.125 to 1
C U A or C U	35–45	1 to 2½	1⅛ in.	5½–7½	4 to 1	2 to 1	1 to 1	4.125 to 1
D U A or D U	45–60	2½ to 4	1¼ in.	5–7	4 to 1	2 to 1	1 to 1	4.125 to 1

Specifications of Cotta Chain Drive Transmission

Model	Truck Capacity		Gears				Gear Ratio				
			Transmission		Different'l						
Chain Drive	H.P.	Tons	Face	Pitch	Face	Pitch	1st	2nd	3rd or Direct	Reverse	Reduction at Differential
B C A	25– 30	½ to 1½	1 in.	6–8	1⅛″	5	4–1	2–1	1–1	4.125–1	3.2 to 1
C C A	35– 45	1 to 2½	1⅛ in.	5½–7½	1⅛″	5	4–1	2–1	1–1	4.125–1	3.2 to 1
D C A	45– 60	2½ to 4	1¼ in.	5–7	1½″	4	4–1	2–1	1–1	4.125–1	3.07 to 1
E C A	55– 80	4 to 6	1½ in.	4½–6	1½″	3½	4–1	2–1	1–1	4.125–1	3.07 to 1
F C A	80–150	6 to 10	2 in.	4–5	2⅜″	3½	4–1	2–1	1–1	4.125–1	3 to 1

Automobile Calendar

ASSOCIATIONS

July 10-11—Chicago, National Automobile Dealers' Assn., Organization Meeting, Hotel La Salle.

Sept. 12-14—Atlantic City, N. J., Motor and Accessory Manufacturers, Mid - Season Meeting.

Sept. 25-28—Pittsburgh, National Assn. of Purchasing Agents, Convention.

CONTESTS
1917

June 23 — Cincinnati, Ohio, Speedway Race.

July 4—Omaha, Neb., Speedway Race, Championship.

July 4—Uniontown, Pa., Speedway Race.

July 4—Tacoma, Wash., Speedway Race.

July 4—Visalia, Cal., Road Race.

July 4—Spokane, Wash., Track Race.

July 4—Benton Harbor, Mich., Track Race.

July 14—Rochester, N. Y., Hillclimb.

July 15—Missoula, Mont., Track Race.

July 17-19—Buffalo, N. Y., Intercity Reliability.

July 22—Anaconda, Mont., Track Race.

July 29— Great Falls, Mont., Track Race.

Aug. 5—Billings, Mont., Track Race.

Aug. 17 — Flemington, N. J., Track Race.

Sept. 3—Uniontown, Pa., Speedway Race.

Sept. 3—Cincinnati, O., Speedway Race, Championship.

Sept. 6—Red Bank, N. J., Track Race.

Sept. 8—Hillclimb, Pike's Peak, for stripped stock chassis.

Sept. 15 — Providence, R. I., Speedway Race, Championship.

Sept. 22—Allentown, Pa., Track Race.

Sept. 28—Trenton, N. J., Track Race.

Sept. 29—New York Speedway Race, Championship.

Oct. 6—Danbury, Conn., Track Race.

Oct. 6—Uniontown, Pa., Speedway Race.

Oct. 13—Richmond, Va., Track Race.

Oct. 13 — Chicago Speedway Race, Championship.

Oct. 27 — New York Speedway Race.

SHOWS

June 20-27 — Montreal, Que., Used Car Show, Coliseum, Montreal Automobile Trade Assn.

Aug. 6-10—Fremont, Neb., General Tractor Demonstration.

Sept. 2-9—Spokane, Wash., Interstate Fair.

Sept. 9-15 — Milwaukee Show, State Park Fair, West Allis.

Sept. 9-15 — Milwaukee, Wis., Fall Show, Wisconsin State Fair, West Allis, Milwaukee Automobile Dealers.

Oct. 13-28—Dallas, Tex., Dallas Automobile & Accessory Dealers Assn. State Fair.

S. A. E. Calendar

Midsummer Meeting

June 25-26—Washington, D. C.

June 26—Informal dinner, New Willard Hotel.

Standard Division Meetings

JUNE

23—Joint meeting Miscellaneous Division with a committee of the A. S. M. E., at Washington. Subject, Nuts for Machine Screws.

25—Standards Committee, Washington.

Engineering Calendar

American Railway Master Mechanics' Assn.
American Institute of Electrical Engineers.
Master Builders' Assn.
American Society of Heating and Ventilating Engineers.
Association Iron and Steel Electrical Engineers.
Mining and Metallurgical Society of America.
Society of Automotive Engineers.
Illuminating Engineering Society.
National Electric Light Assn.
National Gas Engine Assn.
American Society for Testing Materials.
American Institute of Metals.
American Foundrymen's Assn.
Society Naval Architects and Marine Engineers.

JUNE

20-22—Amer. Inst. Chem. Engrs., Ninth Semi-Annual Meeting at Buffalo.

21—Mining & Met. Soc. of Amer. New York section monthly meeting at Engrs. Club.

26-30—Amer. Soc. for Test. Mat. annual meeting Atlantic City, Hotel Traymore, Business meetings, reception and golf tournament.

JULY

7—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.

9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.

9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.

10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.

12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn section at Phila.

13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.

14—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.

16—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.

21—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

AUGUST

4—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.

9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.

10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.

11—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.

13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.

13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit

14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.

20—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.

21—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

SEPTEMBER

1—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.

8—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.

10-14—Assn. Iron & Steel Elec. Engrs. annual convention at Phila.

10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.

10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.

11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.

13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.

14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.

15—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburg section.

17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.

20—Mining & Met. Soc. of Amer. monthly meeting N. Y. section at Engrs. Club.

24—Amer. Inst. Metals at Boston.

24—Amer. Fdry. Assn. annual meeting at Boston.

OCTOBER

6—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.

8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.

9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.

10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.

11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.

13—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.

15—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.

17-18-19 — Amer. Gas, Inst. at Washington, D. C.

18—Mining & Met. Soc. Amer. monthly meeting New York section Engrs. Club.

20—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

NOVEMBER

3—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.

8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penna. section at Phila.

9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.

10—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.

12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.

12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.

13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.

15—Mining & Met. Soc. Amer. monthly meeting New York section at Engrs. Club.

15-16—Soc. Naval Arch. & Marine Engrs. annual meeting.

17—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

19—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.

DECEMBER

1—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.

8—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.

10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.

11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.

13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.

14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.

15—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.

20—Mining & Met. Soc. Amer. monthly meeting New York section at Engrs. Club.